AR201-13116

American Chemistry Council
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July 5, 2001

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Sent Via Hand Delivery

Mr. Oscar Hernandez
US EPA Headquarters
401 M Street, SW
East Tower, 104A
Washington, DC 20460

Subject: High Production Volume (HPV) Chemical Challenge Program – Test Plan Submission

Dear Mr. Hernandez:

The American Chemistry Council Higher Olefins Panel[1] (Panel) submits for review and public comment its test plan, as well as related robust summaries, for the "Higher Olefins" category of chemicals under the Environmental Protection Agency's High Production Volume (HPV) Chemical Challenge Program. The Panel understands that there will be a 120-day review period for the test plan and that all comments generated by or provided to EPA will be forwarded to the Panel for consideration.

This test plan addresses alpha and internal aliphatic olefins, linear and branched, which are within the HPV Challenge Program. The members of the category fall within the ranges of even carbon numbers for C6 – C54 alpha olefins, C13 alpha olefins, and C6 – C18 internal olefins (odd and even carbon numbers). The C6 – C14 even numbered linear alpha olefins are sponsored under the SIDS program. The Panel has committed to sponsor the C6, C7, C8, C9, and C12 aliphatic linear and branched internal olefins and the C16 and C18 aliphatic linear alpha olefins in the ICCA HPV program. Thus, the Panel believes these chemical categories meet the EPA definition of a chemical category and will test them in accordance with the attached test plan.

Briefly, the test plan for the higher olefins category includes the following tests:

- Alga toxicity (OECD 201)
- Acute Daphnid toxicity (OECD 202)
- Oral Reproductive/developmental toxicity screen (OECD 421)

As the Panel developed this test plan, the Panel considered carefully and tried to limit how many animals might be required for tests included in the proposed plan and conditions to which the animals might be exposed. As a result, the Panel believes that the concerns of some non-governmental organizations about animal welfare have been fully considered and that use of animals in this proposed test plan has been minimized.

[1] The members of the Higher Olefins Panel are BP, Chevron Phillips Chemical Company, CONDEA Vista Company, ExxonMobil Chemical Company, Sasol, Shell Chemical Company, Shell Chemicals, Ltd., Spolana a.s. Neratovice, and Sunoco, Inc.

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Thank you in advance for your attention to this matter. If you have any questions regarding the test plan or the robust summaries, or Panel's activities associated with the Challenge Program, please contact me at 703-741-5616 (Phone), 703-741-6091 (Fax) or Doug_Anderson@americanchemistry.com (e-mail).

Sincerely,

W. D. (Doug) Anderson
Manager, Higher Olefins Panel

CC: C. Auer, EPA
Higher Olefins Panel

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UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY (EPA)
HIGH PRODUCTION VOLUME (HPV)
CHEMICAL CHALLENGE PROGRAM

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TEST PLAN

For The

HIGHER OLEFINS CATEGORY

Prepared by:

American Chemistry Council
Higher Olefins Panel

July **5, 2001**

EXECUTIVE SUMMARY

The Higher Olefins Panel (Panel) of the American Chemistry Council and the Panel's member companies hereby submit for review and public comment the test plan for the Higher Olefins category under the United States Environmental Protection Agency's (EPA) High Production Volume (HPV) Chemical Challenge Program. It is the intent of the Panel and its member companies to use new information in conjunction with a variety of existing data and scientific judgment/analyses to adequately characterize the OECD SIDS (Screening Information Data Set) human health, environmental fate and effects, and physicochemical endpoints for this category.

This test plan addresses alpha and internal aliphatic olefins, linear and branched, which are within the HPV Challenge Program. The members of the category fall within the ranges of even carbon numbers for C6 – C54 alpha olefms, C 13 alpha olefins, and C6 – Cl 8 internal olefins (odd and even carbon numbers). The C6 – Cl4 even numbered linear alpha olefins are sponsored under the SIDS program. The Panel has committed to sponsor the C6, C7, C8, C9, and Cl2 aliphatic linear and branched internal olefins and the Cl 6 and Cl 8 aliphatic linear alpha olefins in the ICCA HPV program.

The test plan is based on the expectation that internalizing the location of the carbon-carbon double bond, increasing the length of the carbon chain, and/or changing the carbon skeleton's structure from linear to branched does not change the toxicity profile, or changes the profile in a consistent pattern from lower to higher carbon numbers.

This plan addresses identified testing needs of the category by filling relevant data gaps at the upper and lower ends of the homologous series of Higher Olefins. At the lower end of the homologous series, three tests will be conducted with a C6 internal olefin stream (approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes, 60-74% branched) to include invertebrate acute toxicity, alga toxicity, and 28-day repeated dose rat oral/neuro/reproduction/developmental toxicity screen (OECD 422). For the upper end of the homologous series, a rat oral reproduction/developmental toxicity screen (OECD 42 1) will be conducted with a Cl8 internal olefin (20-30% branched). The results of these tests will be compared with available data for other homologs within the series of olefins. If the results from the above testing confirm that the toxicity profiles of all members of the Higher Olefins category are essentially the same, or a pattern from lower to higher carbon numbers exists, any remaining data gaps can be considered to fall within the ranges defined by the data and no further testing will be warranted. If the results do not confirm that hypothesis, a reassessment of the category will be conducted.

Predictive computer models will be used to develop relevant environmental fate and physicochemical data for chemicals in the Higher Olefins category. Environmental fate information will be summarized either through the use of computer models when meaningful projections can be developed or in technical discussions when computer modeling is not applicable. For mixed streams, physicochemical properties will be represented as a range of values according to component composition. These data will be calculated using a computer

model cited in an EPA guidance document prepared for the HPV Challenge Program. In addition, measured physicochemical data will be provided for selected product streams in this category where readily available.

American Chemistry Council's

HIGHER OLEFINS PANEL

The Higher Olefins Panel includes the following member companies:

BP

Chevron Phillips Chemical Company LP

CONDEA Vista Company

ExxonMobil Chemical Company

Shell Chemical Company

Shell Chemicals Ltd.

Sasol

Spolana a.s. Neratovice

Sunoco, Inc.

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TEST PLAN FOR THE HIGHER OLEFINS CATEGORY

I. INTRODUCTION

The Higher Olefins Panel (Panel) of the American Chemistry Council and the Panel's member companies have committed to develop screening level human health effects, environmental effects and fate, and physicochemical test data for the Higher Olefins category under the United States Environmental Protection Agency's (EPA's) High Production Volume (HPV) Challenge Program (Program).

This plan identifies CAS numbers used to describe substances in the category, identifies existing data of adequate quality for substances included in the category, and outlines testing needed to develop screening level data for this category under the Program. This document also provides the testing rationale for the Higher Olefins category. The objective of this effort is to identify and develop sufficient test data and/or other information to adequately characterize the human health and environmental effects and fate for the category in compliance with the EPA HPV Program. Physicochemical data that are requested in this program will be calculated as described in EPA guidance documents. In addition, measured physicochemical data will be provided for selected product streams in this category where readily available.

II. BACKGROUND

Most higher alpha olefins are manufactured on a commercial scale by oligomerization of ethylene or propylene. The materials produced are mixtures including a range of molecular weights. These broad mixtures can be subsequently distilled into narrower mixtures or discrete chemical substances. The internal olefins are made from alpha olefins by isomerization or by isomerization/disproportionation, which can result in mixed chain length internal olefins. Oligomerization of ethylene generally leads to linear alpha olefins. Certain branched structures are also produced, typically as minor components, though levels increase with molecular weight and can be significant. Oligomerization of propylene generally produces branched alpha olefins. Various degrees of alkyl chain branching can be introduced by catalytic isomerization of linear oletins.

Two other routes to higher olefins are of commercial significance. Mixed alpha olefins are produced from synthesis gas (carbon monoxide and hydrogen) via Fischer-Tropsch type oligomerization. Internal olefins are produced from normal paraffins by partial catalytic dehydrogenation. Commercially valuable components are obtained via distillation or molecular sieve extraction followed by one or more purification steps.

Commercial higher olefins thus can range from narrowly defined substances to complex mixtures of alpha and internal, linear and branched oletins characterized by carbon range and physical properties.

III. DESCRIPTION OF THE HIGHER OLEFINS CATEGORY

This test plan addresses aliphatic alpha and internal olefins, linear and branched, which are within the HPV Challenge Program. The members of the category fall within the ranges of C6 – C54 alpha olefins (even carbon numbers except for C 13) and C6 – Cl8 internal olefins (odd and even carbon numbers). The C 16, Cl 8, and C20-24 alpha olefins are linear. Neohexene is branched. The C24 – C54 alpha olefins fraction is a mixture of branched and linear isomers. The internal olefins are mostly linear, mostly branched, or a mixture of linear and branched isomers. The members of the category are presented in Table 1.

Table 1: Members of the Category

Alpha Olefms	**Branched/Linear**	CAS No.
Neohexene	Branched	558-37-2
1 -Tridecene	Linear	2437-56-1
1 -Hexadecene (ICCA)	Linear	629-73-2
1-Octadecene (ICCA)	Linear	112-88-g
1 -Eicosene	Linear	3452-07-1
1 -Docosene	Linear	1599-67-3
1-Tetracosene	Linear	10192-32-2
Alkenes, C10-16 alpha	Linear	68855-58-3
Alkenes, C14-18 alpha	Linear	68855-59-4
Alkenes, C14-20 alpha	Linear	68855-60-7
a-Olefin fraction C20-24 cut	Linear	93924-10-8
a-Olefin fraction C24-28 cut	Branched and Linear	93924-11-9
Alkene, C24-54 branched and linear, alpha	Branched and Linear	131459-42-2
Internal Olefins		
Hexene (ICCA)	Linear	25264-93-1
Heptene (ICCA)	Linear	25339-56-4
Octene (ICCA)	Linear	25377-83-7
Nonene (ICCA)	Linear	27215-95-8
Dodecene (ICCA – not sponsored in HPV)	Linear	25378-22-7
Alkenes, C6	Branched and Linear	68526-52-3
Alkenes, C6-8, C7 rich	Branched and Linear	68526-53-4
Alkenes, C7-9, C8-rich	Branched and Linear	68526-54-5
Alkenes. C8-10. C9-rich	Branched and Linear	68526-55-6
Alkenes, C9- 11, C 1 O-rich	Branched and Linear	68526-56-7
Alkenes, C 10- 12, C 11 -rich	Branched and Linear	68526-57-8
Alkenes, C 1 1 - 13, C 12-rich	Branched and Linear	68526-58-9
Heavy polymerization naphtha (petroleum)	Branched	68783-l O-8
Alkenes. C 10- 16	Linear	6899 l-52-6
Alkenes, C 15-C 18	Linear	93762-80-2
C 10,12 Olefin rich hydrocarbons	Linear	685 14-32-9
C 12,14 Olefin rich hydrocarbons	Linear	685 14-33-O

The category is defined as Higher Olefins. This category consists of discrete chemicals with an incremental change across its members. This includes:

- Olefins with even and odd carbon numbers
- Both alpha and internal olefins, referring to the position of the olefinic double bond
- Linear and branched (alkyl side chains with no other functional groups included)

Iv. EVALUATION OF EXISTING HEALTH EFFECTS DATA AND PROPOSED TESTING

A large body of data exists for aliphatic alpha and internal olefins (see Tables 6 and 7). The C6 – C 14 alpha olefins (even carbon numbers) are sponsored under the OECD SIDS High Production Volume Chemicals Program.

Based on the data that are available, the mammalian toxicity profile for the Higher Olefins is not affected by changes in the location of the double bond or the addition of branching to the structure. The only adverse health effects that have been seen are mild eye and skin irritation (in most cases not meeting regulatory criteria for irritants), lung damage/death caused by aspiration of the liquid products, and male rat nephropathy which is not considered to be relevant for human health.

Existing data show similar results in acute toxicity studies with alkenes ranging in carbon number from C6 to C24, alpha and internal, and linear and branched. Similar results were also seen in repeated-dose studies with C6, C8 and C 14 linear alpha olefins, Cl 6/C18 internal olefins (25-30% branched), and C20-24 internal olefins (approximately 40% branched).

Many of the homologs within the series, both alpha and internal, and branched and linear, have been tested for genotoxicity. All studies except two were negative. A C6 branched and linear internal alkenes blend produced a weakly positive response in a mouse micronucleus study using oral administration. However, when the study was repeated using an inhalation route, the results were negative. The Ames Test was also negative. Mouse micronucleus tests with 1-hexene and with a C6-8, C7 rich, internal branched and linear alkenes blend were negative by the oral route of administration. Another C6 alkene, neohexene, produced a slight increase in mutant frequency in the mouse lymphoma test at the highest dose level. As there was no dose response and the increase was slight, the biological significance of this response is questionable. Based on the weight of evidence, the compounds within the category are not genotoxic.

The identified adverse health effects of higher olefins (mild irritation, aspiration hazard) appear to be related to their physical rather than to their chemical properties. As the length of the olefin carbon chain increases, the materials become waxy/solid rather than liquid. The point at which the change from liquid to solid occurs appears to be affected by the change in location of the double bond and/or the degree of branching. For example, the C20-24 internal

branched and linear material is a liquid at room temperature while the linear alpha product is a solid. The predicted adverse human health effects (irritation and aspiration) of these materials is highest at the low end of the carbon range, and is expected to decrease as the carbon number and viscosity increase. Male rat nephropathy was reported on subchronic administration of C6 and Cl 4 linear alpha olefins, but was not seen in the C 16/C 18 or in the C20-24 internal branched and linear alkenes, and is not considered to be relevant for human hazard assessment.

To test the hypothesis, at the lower molecular weight end of the series, that internalizing the location of the double bond and/or changing the structure from linear to branched does not change the toxicity profile, the HPV battery of tests with an internal olefin at the low end of the category (C6 internal olefin stream containing approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes, 60-74% branched) will be completed for all mammalian toxicity endpoints and the results compared with available data for 1-hexene. To complete the HPV battery, an OECD 422, 28-Day Repeated Dose Rat Oral/Neuro/Reproduction/Developmental Toxicity Screen will be conducted. Adequate data exist for the other endpoints.

We will also test this same hypothesis near the upper molecular weight end of the series by conducting an OECD 42 1 Rat Oral Reproduction/Developmental Toxicity Screen with a C 18 mostly linear (20-30% branched) internal olefin. These results will be compared with similar data from an OECD 422 study on 1-tetradecene. These results will also be compared with data from an OECD 408 rat 90-day repeated-dose toxicity study with a C20-24 branched and linear (approximately 40% branched) internal olefins fraction. The OECD 421 test will also serve to confirm a lack of reproductive or developmental toxicity in the members near the upper end of the series. The Cl 8 internal olefin that will be tested is not an HPV material and is not a member of the category; however, it is a component of one of the members of the category and represents the upper end of the series of internal olefins within the category.

Since the upper end of the alpha olefin series of olefins is a waxy solid that is not likely to be bioavailable, and repeated dose toxicity and reproductive/developmental toxicity data exist for the more bioavailable Cl4 alpha olefin, testing of the C24 – C54 alpha olefin was not considered useful in characterizing the hazard potential of the category or appropriate, taking animal welfare considerations into account.

Summary:

<u>Acute Toxicity:</u> Acute toxicity studies exist for materials at both ends of the carbon number ranges in the series of olefins within this category and for many of the homologs within the series. The results are consistent throughout the category. Consequently, no acute toxicity testing is planned for this category.

<u>Repeated Dose and Reproductive/Developmental Toxicity</u>: Repeated dose toxicity and reproduction/developmental studies exist for C6 and Cl4 alpha olefms. Repeated dose toxicity studies exist for C16/C18 (25-30% branched) and C20-24 (approximately 40%

branched) blends of internal olefms. Results from alpha and internal olefins, whether linear or branched, or low or high carbon numbered, are consistent. A 28-day repeated dose oral/neuro/reproduction/developmental toxicity study in rats (OECD 422) will be conducted with a C6 internal olefm stream (containing approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes, 60-74% branched). An oral reproduction/ developmental toxicity screen in rats (OECD 421) will be conducted with a Cl8 mostly linear (20-30% branched) internal olefin. The results from these tests will be compared with the existing data. If the results are consistent, these data will be considered adequate to address the potential health hazards of the category.

Genetic Toxicity: Tests for gene mutation and chromosome aberrations exist for C6 and C18 linear alpha olefins and for a C6 internal olefin stream (containing approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes, 60-74% branched) and for a C20-24 internal olefins (40% branched), and for several of the homologs within those ranges. Based on the weight of evidence, these compounds are not genotoxic . No genetic toxicity testing is planned for this category.

V. EVALUATION OF EXISTING PHYSICOCHEMICAL AND ENVIRONMENTAL FATE DATA AND PROPOSALS FOR ADDRESSING THESE ENDPOINTS

Phvsicochemical Properties

Physicochemical data for each of the members of the Higher Olefins category will be developed using the EPIWIN© model (Ref. 1), as discussed in the EPA document titled "The Use of Structure-Activity Relationshins (SAR) in the High Production Volume Chemicals Challenge Program." In addition, measured physicochemical data will be provided for selected product streams in this category where readily available.

Biodegradation

Existing data show that selected chemicals in this category can biodegrade aerobically to a large extent within a few weeks and, for some chemicals, the data show that they fit the OECD criteria for Ready Biodegradability. The C6 – C 16 alpha olefins have been shown to degrade to an extent of approximately 21 to 77% in standard 28-day biodegradation tests. Results of studies for two higher molecular weight olefins (a Cl8 linear alpha olefin and a C20-24 branched and linear internal olefin) suggest that the higher alpha olefins have the potential to exhibit a significantly high, >60%, extent of biodegradation. Theoretically, the branched olefins might be expected to be significantly less biodegradable. However, the existing data do not support this supposition. Testing in an OECD 301B test with a C20-24 branched and linear material (approximately 40% branched) resulted in 92% degradation in 28 days. Sufficient data are available to assess the potential biodegradability of this category. Therefore, no additional biodegradation tests will be conducted.

Photodegradation, Hydrolysis, and Fugacity

The endpoints for photodegradation, hydrolysis, and fugacity will be either calculated or discussed. Chemical equilibrium models are used to calculate fugacity, which is only calculated. The lower homologs in the Higher Olefins category (C6 – C14) are calculated to partition primarily to the air, and therefore their fate in air is of environmental relevance (this aspect is discussed below under photodegradation). In addition, these components have relatively low Kow values, which suggests that they will not tend to partition to suspended organic matter in air and precipitate to aquatic and terrestrial compartments. The higher homologs in the category are calculated to partition primarily to the soil and sediment.

1. Photodegradation – Photolysis

Direct photochemical degradation occurs through the absorbance of solar radiation by a chemical substance. If the absorbed energy is high enough, then the resultant excited state of the chemical may undergo a transformation. Simple chemical structures can be examined to determine whether a chemical has the potential for direct photolysis in water. First order reaction rates can be calculated for some chemicals that have a potential for direct photolysis using the procedures of Zepp and Cline (Ref. 2). UV light absorption of the substances in the category will be evaluated to identify those having the potential to degrade in solution. For those compounds with a potential for direct photolysis in water, first order reaction rates will be calculated.

2. Photodegradation – Atmospheric Oxidation

Photodegradation can be measured (Ref. 3) (EPA identifies OECD test guideline 113 as a test method) or estimated using models accepted by the EPA (Ref. 4). An estimation method accepted by the EPA includes the calculation of atmospheric oxidation potential (AOP). Atmospheric oxidation is a result of hydroxyl radical attack and is not direct photochemical degradation, but rather indirect degradation. AOPs can be calculated using a computer model. Hydrocarbons, such as the majority of the chemicals in the Higher Olefins category, readily volatilize to air. In air, chemicals may undergo reaction with photosensitized oxygen in the form of ozone and hydroxyl radicals. The computer program AOPWIN (atmospheric oxidation program for Microsoft Windows) (Ref.1) is used by OPPTS (the EPA's Office of Pollution Prevention and Toxic Substances). This program calculates a chemical half-life based on an overall hydroxyl radical (OH) reaction rate constant, a 12-hr day, and a given OH concentration. This calculation will be performed for the substances in the category.

3. Stability in Water (Hydrolysis Testing and Modeling)

Hydrolysis of an organic chemical is the transformation process in which a water molecule or hydroxide ion reacts to form a new carbon-oxygen bond. Chemicals that have a potential to hydrolyze include alkyl halides, amides, carbamates, carboxylic acid esters and lactones, epoxides, phosphate esters, and sulfonic acid esters (Ref. 5). Stability in water can be measured (Ref. 3) (EPA identifies OECD test guideline 111 as a test method) or estimated using models accepted by the EPA (Ref. 4). An estimation method accepted by the EPA

includes a model that can calculate hydrolysis rate constants for esters, carbamates, epoxides, halomethanes, and selected alkylhalides. The computer program HYDROWIN (aqueous hydrolysis rate program for Microsoft windows) (Ref. 1) is used by OPPTS.
All of the chemical structures included in the Higher Olefins category are simple hydrocarbons. That is, they consist entirely of carbon and hydrogen. As such they are not expected to hydrolyze at a measurable rate. A technical document will be prepared describing the potential hydrolysis rates of these substances, the nature of the chemical bonds present, and the potential reactivity of this class of chemicals with water.

4. Chemical Distribution In The Environment (Fugacity Modeling)

Fugacity based multimedia modeling can provide basic information on the relative distibution of chemicals between selected environmental compartments (i.e., air, soil, sediment, suspended sediment, water, biota). The EPA has acknowledged that computer modeling techniques are an appropriate approach to estimating chemical partitioning (fugacity is a calculated endpoint and is not measured). A widely used fugacity model is the EQC (Equilibrium Criterion) model (Ref. 6). EPA cites the use of this model in its document titled *Determining the Adequacy of Existing Data* (Ref. 3), which was prepared as guidance for the HPV Program.

In its document, EPA states that it accepts Level I fugacity data as an estimate of chemical distribution values. The input data required to run a Level I model include basic physicochemical parameters; distribution is calculated as percent of chemical partitioned to 6 compartments (air, soil, water, suspended sediment, sediment, biota) within a unit world. Level I data are basic partitioning data that allow for comparisons between chemicals and indicate the compartment(s) to which a chemical is likely to partition.

The EQC Level I is a steady state, equilibrium model that utilizes the input of basic chemical properties including molecular weight, vapor pressure, and water solubility to calculate distribution within a standardized regional environment. This model will be used to calculate distribution values for substances in this category. A computer model, EPIWIN – version 3.02 (Ref. 1), will be used to calculate the properties needed to run the Level I EQC model.

Summary:

Phvsicochemical Properties: Physicochemical data will be calculated for representative chemicals in this category. In addition, measured physicochemical data will be provided for selected product streams in this category where readily available.

Biodegradation: Adequate data exist to characterize the aerobic biodegradation potential of the category. No biodegradation testing is planned for this category.

Photodegradation and Hydrolysis: AOP data will be calculated for representative chemicals in this category. In addition, the potential for chemicals in this category to undergo direct photolysis in water will be assessed. A technical discussion on the potential of substances in this category to hydrolyze will be prepared.

Fugacity: data will be calculated for representative chemicals in this category.

VI. EVALUATION OF EXISTING ECOTOXICITY DATA AND PROPOSED TESTING

Aquatic endpoints for the HPV Chemical Program include acute toxicity to a freshwater fish and invertebrate, and toxicity to an alga. The product streams of this category are expected to cause a narrow range of toxicity to these species within the range of solubilities acceptable for measuring acute toxicity, which for this category includes those C6 through approximately Cl0 olefins. This initial assessment is based on existing data for products that can be used to read across to this category and results of computer modeling using ECOSAR for selected chemical components of product streams in this category [ECOSAR is an aquatic toxicity modeling program and is a subroutine contained in EPIWIN']. The relatively narrow range of toxicity for the lower molecular weight members of the category is not unexpected because:

- Constituent chemicals of product streams in this category are neutral organic hydrocarbons whose toxic mode of action is non-polar narcosis and whose potencies are equivalent within the range of solubilities acceptable for measuring acute toxicity, which for this category includes those C6 through approximately C 10 olefins.
- Although the bond location is different for alpha olefins and internal olefins, the aquatic toxicities are anticipated to be similar.

The toxic mechanism of short-term toxicity for these types of chemicals is disruption of biological membrane function, and the differences between measured toxicities (i.e., LC/LL50, EC/EL50) can be explained by the differences between the target tissue-partitioning behavior of the individual chemicals. The existing fish toxicity database for narcotic chemicals supports a critical body residue (CBR, the internal concentration that causes mortality) of between 4-5 mmol/kg fish (wet weight), and supports the assessment that these chemicals have equal potencies within the range of solubility that results in toxicity. When normalized to lipid content, the CBR is approximately 50 umol of hydrocarbon/g of lipid for most organisms.

The higher olefins addressed in this HPV program are essentially alpha olefins, internal olefins, and mixtures of olefins with varying degrees of branching and carbon chain length. The nature of these materials suggests that: 1) toxicity does not differ with bond location, alpha compared to internal, and 2) branching is not a major factor in toxicity for this class of chemicals. The examples shown in the tables below, illustrate this point. EPIWIN was used to estimate product solubility and octanol/water partitioning. The log Kow was used in the EPA ECOSAR toxicity estimation program.

In Table 2, the acute toxicities of fish, *Daphnia* and algae are compared from the ECOSAR estimates. A clear series of increasing acute toxicity with increase in carbon length is

observed. Also, the water solubility decreased greatly with increasing carbon chain length. Another set of ECOSAR model predictions for both alpha and internal olefins in Table 3 shows similar toxicity regardless of the nature of the bond location.

Table 2. MIXED INTERNAL OLEFINS ▪ ACUTE TOXICITY ESTIMATED FROM ECOSAR

Chemical	CAS #	fish 96h LC50 (mg/L)	Daphnid 48h LC50 (mg/L)	greenalgae 96hEC50 (mg/L)	water solubility (calculated) (mg/L)	log Kow (KowWin estimated)
hexene	25264-93-l	6.16	7.10	4.72	30.32	3.07
heptene	25339-56-4	0.83	1.03	0.73	3.35	4.13
octene	25377-83-7	0.83	1.03	0.73	3.35	4.13
nonene	27215-95-8	0.38	0.48	0.35	1.41	4.55
dodecene	25378-22-7	0.017	0.025	0.020	0.049	6.10
hexadecene	26952-14-7	no CAS # match in ECOSAR				
octadecene	27070-58-2	4.51E-05	7.87E-05	7.38E-05	7.40E-05	9.04

A comparison of predictions for l-, 2-, and 3- hexene for fish, *Daphnia* and algae show similar toxicity within each individual species. This is in part resulting from the partitioning coefficient predictions discussed earlier in the section. The prediction is consistent through 1- and 5- decene with toxicity increasing with carbon chain length and no difference between bond location either internal or in the alpha position. A third point made to confirm toxicity related specifically to partitioning coefficient for narcosis chemicals is shown in Table 4 where the degree of branching is compared for toxicity within a specific olefin and across the series. There is little or no difference in toxicity of the listed olefins when equal carbon number is compared. The three groups shown in Table 4 are predicted to have similar aquatic acute toxicity if carbon numbers are equal. The degree of branching does not have a specific effect.

Product solubility in solution during toxicity testing is critical to understanding both observations and estimates of effects. For acute toxicity, the existing data (Table 5) indicate that through the C 10 olefins, acute toxicity can be observed. Solubility is within the range of observed acute toxicity. For an internal decene stream, the acute toxicity to fish was observed to be 0.12 mg/L and the corresponding estimated solubility using ECOSAR suite is

2.51 mg/L. The effects seen in algae, Daphnia, and fish are approximately equal at water solubility. However, since that value is the LC50, there were concentrations above the LC50 of 0.12 mg/L that may not have been in solution. Above Cl0 the olefins are insoluble at levels that could cause acute toxicity and data become not usable. The results for tetradecene and higher carbon numbers indicating LC50 > 1000 mg/L only show that there was no toxicity at any exposure concentration. The solubility was too low to have resulted in toxicity. Therefore, meaningful acute toxicity data can be identified below Cl0 where solubility is high enough to allow the acute effects to be expressed.

(Table 3. ALPHA & INTERNAL OLEFINS - ACUTE TOXICITY ESTIMATED/ FROM ECOSAR

Chemical	CAS #	fish 96h LC50 (mg/L)	daphnid 48h LC50 (mg/L)	green algae 96h EC50 (mg/L)	water solubility (calculated) (mg/L)	Log Kow (KowWin estimated)
1-hexene	592-41-6	5.18	6.01	4.01	25.13	3.15
t-2-hexene	4050-45-7	6.16	7.10	4.72	30.32	3.07
t-3-hexene	13269-52-8	6.16	7.10	4.72	30.32	3.07
1-heptene	592-76-7	2.09	2.51	1.73	9.27	3.64
t-2-heptene	14686-13-6	2.49	2.97	2.03	11.19	3.56
t-3-heptene	14686-14-7	2.49	2.97	2.03	11.19	3.56
1-octene	111-66-0	0.83	1.03	0.73	3.35	4.13
t-2-octene	13389-42-9	0.96	1.19	0.84	3.95	4.06
3-octene (E)	14919-01-8	0.96	1.19	0.84	3.95	4.06
t-4-octene	14850-23-8	0.96	1.19	0.84	3.95	4.06
1-decene	872-05-9	0.12	0.16	0.12	1.04	5.12
t-5-decene	7433-56-9	0.14	0.19	0.14	1.21	5.04
1-dodecene	112-41-4	0.017	0.025	0.020	0.049	6.1
1-octadecene	112-88-9	4.51E-05	7.87E-05	7.38E-05	7.40E-05	9.04

Determining the aquatic toxicity of products that have relatively low water solubility and higher vapor pressure, like those in this category, can be difficult because they tend not to remain in solution. These data show that the measured and calculated values are in good agreement through octene, and they also support that the test methods used procedures that were able to maintain exposures.

The testing will include an alga toxicity test (OECD Guideline 201) and a *Daphnia* sp. acute toxicity test (OECD Guideline 202) on a C6 branched (60-74%) internal olefin to fill the data gaps at the lower end of the homologous series of internal olefins. This material is representative of the low end of the higher olefin category based upon the estimates in Tables *2, 3,* and 4.

Table 4. BRANCHED OLEFINS - ACUTE TOXICITY ESTIMATED FROM ECOSAR

Chemical	CAS #	fish 96h LC50 (mg/L)	daphnid 48h LC50 (mg/L)	green algae 96h EC50 (mg/L)	water solubility (calculated) (mg/L)	log Kow (KowWin estimated)
2-methyl-1-pentene	763-29-1	4.55	5.30	3.55	21.82	3.21
4-methyl-1-pentene	691-37-2	6.02	6.96	4.63	29.62	3.08
3,3,-dimethyl-1-butene	558-37-2	6.57	7.56	5.02	32.53	3.04
2-methyl-1-hexene	00604-02-6	1.84	2.21	1.53	8.06	3.70
2-methyl-1-heptene	15870-10-7	0.73	0.91	0.64	2.91	4.19
2,4,4,-trimethyl-1-pentene	107-39-1	0.92	1.14	0.80	3.77	4.08

Summary:

The lower homologs of the Higher Olefins category are sufficiently water soluble to produce acute aquatic toxicity, as has been reported for C6 – Cl0 alpha and internal olefms. The higher molecular weight olefms, those greater than C12, whose water solubilities are low, are not expected to cause acute aquatic toxicity based on the available data for selected substances. Testing with water accommodated fractions of C14, C16, and C20-24 alpha olefins and C16, C18, and C20-24 internal branched and linear olefms showed no aquatic toxicity in acute tests with fish, invertebrates, and algae. The available data, as shown in Table 5, indicate that water solubility (which is inversely proportional to the length of the alkyl chain), and not the position of the olefmic double bond (alpha or internal) or branching, influences whether a substance will produce acute aquatic toxicity. Acute toxicity tests with *Daphnia magna* and an alga species will be conducted with a C6 branched (60-74%) internal olefin (containing

approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes) to fill the data gaps at the lower end of the homologous series of internal olefins. The testing will include an alga toxicity test (OECD Guideline 201) and a *Daphnia* sp. acute toxicity test (OECD Guideline 202).

In addition, the aquatic toxicity of selected olefins will be modeled and the data used to further support the expected acute aquatic toxicity of this category.

VII. TEST PLAN SUMMARY

The following testing, modeling, and technical discussions will be developed for the Higher Olefins category (Table 8):

- To test the hypothesis, at the lower end of the series, that internalizing the location of the double bond and/or changing the structure from linear to branched does not change the toxicity profile, the HPV battery of tests with a branched (60-74%) internal olefin at the low end of the category (C6 internal olefin stream containing approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes) will be completed for all mammalian toxicity endpoints and the results compared with available data for 1 -hexene. An OECD 422, 28-Day Repeated Dose Rat Oral/Neuro/Reproduction/Developmental Toxicity Screen, will be conducted. Adequate data exist for the other endpoints.

- The location of the double bond and/or changing the structure from linear to branched is not expected to affect the level of aquatic toxicity to a significant degree based on results of modeling (ECOSAR, Ref. 1) for selected lower molecular weight alpha and internal olefins (C6 - 10). To adequately characterize the aquatic toxicity endpoints for the lower molecular weight olefins, two aquatic toxicity studies, the Algal (OECD 201) and Acute Daphnid Toxicity (OECD 202) Tests, will be conducted with a C6 branched (60-74%) internal olefin stream containing approximately 76% C6 alkenes, 16% C6 alkanes, 7% C7 alkenes. In addition, modeling for other selected lower molecular weight olefins will be conducted to support existing data and to fully characterize the algal and acute fish and invertebrate toxicity range of olefins.

- To test the hypothesis, near the upper end of the series, that changing the location of the double bond or changing the structure from linear to branched does not change the toxicity profile, an OECD 421 Rat Oral Reproduction/Developmental Toxicity Screen will be conducted with a C 18 branched and linear internal olefin (20-30% branched) and the results will be compared with data for 1-tetradecene, for which there is available an OECD 422 study, and for C20-24 branched and linear internal olefins, for which there is available an OECD 408 rat 90-day repeated-dose toxicity study. This test will also serve to confirm a lack of reproductive or developmental toxicity in the members near the upper end of the series.

- A technical discussion on the potential of representative chemicals in this category to

photodegrade will be prepared and atmospheric oxidation potentials for representative chemicals in this category will be calculated.

- A technical discussion on the potential of chemicals in this category to hydrolyze will be prepared.

- Fugacity data for representative chemicals in this category will be calculated.

- Physicochemical data as described in the EPA document titled, *The Use of Structure-Activity Relationships (SAR) in the High Production Volume Chemicals Challenge Program* will be calculated for representative chemicals in this category. In addition, measured physicochemical data will be provided for selected product streams in this category where readily available.

If the results from the above testing confirm that the toxicity profiles of all members of the Higher Olefins category are essentially the same, and/or a pattern from lower to higher carbon numbers exists, then any remaining data gaps can be considered to fall within the ranges defined by the data and no further testing will be warranted. If the results do not confirm that hypothesis, a reassessment of the category will be conducted.

Summaries of results will be developed once the data and analyses are available. This test plan is expected to provide adequate data to characterize the human health effects and environmental fate and effects endpoints for the category under the Program.

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Table 5: Algae Toxicity and Invertebrate and Fish Acute Toxicity of C6-24 Alkenes

Species	Duration	Endpoints (mg/L)	Comments
C6			
Algae			
Selenastrum capricomutum	96-hr EC50	22	1-hexene >96%. Endpoint was biomass; no attempt to prevent evaporation
Invertebrate			
Daphnia magna	48-hr EC50	30-60	1-hexene >96%.
Daphnia magna	48-hr EC50	230	I-hexene >96%. Static, test result is above water solubility; no attempt to prevent evaporation
Vertebrates			
Rainbow trout (Salmo *gairdneri)*	48-96-hr LC50	9.7, 5.6, 5.6 and 24	I-hexene >96%. Semi-static, minimal headspace to prevent losses through evaporation
Rainbow trout *(Salmo gairdneri)*	96-hr LC50 96-hr LL50	6.6 12.8	Alkenes, C6 (internal branched stream). Mortality, semi-static; no headspace; WAF[1]
Zebra fish *(Brachiodanio* rerio)	96-hr LC50	25-50	1-hexene >96%. Semi-static, stirred 4 h before adding fish, glass beaker covered with a watch glass; also tested in glass-stoppered flask
C8			
Algae			
Selenastrum capricornutum	48-hr EC50	200	C6-8 AO[2] blend (C6 =48%, C7=36%, C8= 16%). Endpoint was biomass; no attempt to prevent evaporation; reported value exceeds water solubility limit
Invertebrate			
Daphnia magna	24-hr EC50	>3.2<10	1-octene >99%. Static, stirred 4 h before adding test animals, glass beaker covered with a watch glass; also tested in glass-stoppered flask
Vertebrates			
Zebra fish *(Brachiodanio rerio)*	24-96-hr LC50	3.2	1-octene >99%. Static, stirred 4 h before adding fish, glass-stoppered flask, open and closed, nominal with t-butanol as carrier. Without t-butanol as a carrier, the 48-96 hr LC50= 4.8
Rainbow trout (Salmo *gairdneri)*	96-hr LC50 96-hr LL50	0.87 8.9	Alkenes, C7-9, C8 rich (internal branched stream). Mortality, semi-static; no headspace;WAF
Cl0 and Cl2			
Algae			
Selenastrum capricornutum	96-hr EC50	22	C10-13 AO blend (C10-11=30%, C11-12=31%, C12=11%, C13=21%). Static, vessels not sealed, solution aerated. Concentrations utilized in testing were greater than the water solubility
Scenedesmus subspicatus	72-hr E_bC50	15.4	Idodecene >97%. Endpoint was biomass: reported value exceeds water solubility limit
Invertebrates			
Daphnia magna	24-hr EC50 48-hr EC50	720 480	C10-13 AO blend (C10-11=30%, C11-12=31%, C12=11%, C13=21%). Static, vessels not sealed, solution aerated, concentrations utilized in testing were greater than the water solubility
Vertebrates			
Rainbow trout (Salmo *gairdneri)*	96-hr LC50 =	>1000	C10-13 AO blend (C10-11=30%, C11-12=31%, C12=11%, C13=21%). Semi-static, vessels not sealed, solution aerated; concentrations utilized in testing were greater than the water solubility
Rainbow trout (Salmo *gairdneri)*	96-hr LC50 96-hr LL50	0.12 4.8	Alkenes, C9-11, C10 rich (internal branched stream). Mortality, semi-static; no headspace; WAF
Rainbow trout *(Salmo gairdneri)*	96-hr LLO	86.0	Alkenes, Cl I-13, C 12 rich (internal branched stream). Mortality, semi-static; no headspace;WAF
C14			
Algae			
Selenastrum capricornutum	72- 96 hr ELO	1000	I-tetradecene 99%. Growth; static test; WAF
Invertebrates			
Daphnia magna	24-hr ELO and 48-hr ELO	1000	1-tetradecene 99%. Immobility; semi-static test
Vertebrates			
Rainbow trout (Salmo *gairdneri)*	96-hr LLO	1000	1-tetradecene 99%. Mortality; semi-static test

[1] WAF= Water Accommodated Fractions test procedure was used due to the low water solubility of the test material.

[2] AO = Alpha Olefin

Species	Duration	Endpoints (mg/L)	Comments
C16 and C18			
Algae			
Selenastrum capricornutum	72-hr ELO	1000	I-hexadecene. Growth; static test; WAF
Selenastrum capricornutum	96-hr EC50	>1000	I -octadecene. Growth; static test; concentrations utilized in testing greater than solubility; no toxicity seen at 1000 mg/l
Invertebrates			
Daphnia magna	24-hr EC50 and 48-hr EC50	>1000	1 -octadecene. Immobility; static test; concentrations utilized in testing greater than solubility
Vertebrates			
Rainbow trout (*Salmo gairdneri)*	96-hr EC50	>1000	I -octadecene. Mortality; semi-static test; concentrations utilized in testing greater than solubility; no toxicity seen at 1000 mg/l
Turbot (*Scophthalmus maximus*)	96-hr LC50	> 10,000	C16/C18 internal linear and branched blend (50/50). Mortality; semi-static test
C20-24			
Algae			
Selenastrum capricornutum	72-hr ELO	1000	C20-24 linear AO blend. Growth; static test; WAF
Selenastrum capricornutum	72-hr ELO	1000	C20-24 internal linear and branched blend. Growth; static test; WAF
Invertebrates			
Daphnia magna	48-hr ELO	1000	C20-24 internal linear and branched blend. Immobility; static test
Vertebrates			
Rainbow trout (*Oncorhynchus mykiss)*	96-hr LLO	1000	C20-24 linear AO blend. Mortality; semi-static test; WAF
Rainbow trout (*Oncorhynchus mykiss)*	96-hr LLO	1000	C20-24 internal linear and branched blend. Mortality; semi-static test; WAF

Table 6. Existing Data for Higher Olefins

Alpha Olefins															
		Human Health Effects						Ecotoxicity			Environmental Fate				
Chemical Name	CAS #	Acute Toxicity	Genetic Point Mutation	Genetic Chrom. Aberr.	Sub-chronic	Developmental	Reproduction	Acute Fish	Acute Invert.	Algal Toxicity	Physical Chem.	Photodegradation	Hydrolysis	Fugacity	Biodegradation
1-Hexene[1]	592-41-6 Linear	√	√	√	√	√	√	√	√					√	√
Neohexene	558-37-2 Branched	√	√												
1-Octene[1]	111-66-0 Linear	√	√	√	√			√	√					√	
1-Decene[1]	872-05-9 Linear	√	√												√
1-Dodecene[1]	112-41-4 Linear	√	√	√	√			I	I	√[5]					
1-Tetradecene[1]	1120-36-1 Linear	√	√	√	√	√	√	√	√	√				√	√
1-Hexadecene[2]	629-73-2 Linear	√	√	√				√		√					√
1-Octadecene[2]	112-88-9 Linear	√[3]	√	√				√[6]	√[6]	√[6]					√
C12-16[4] (even numbers)	see C12,14, 16 above Linear		√	√											
C14-18 (even numbers)	68855-59-4 Linear	√													
C20-24 (even numbers)*	93924-10-8 Linear	√						√		√					
C22-28 (even numbers)*	93924-11-9 Branched and Linear	√													
C24-54 (even numbers)*	131459-42-2 Branched and Linear	√													

√ Adequate existing data available

I Robust Summaries will not be submitted, summaries are available in the OECD SIDS dossiers.

2 Robust Summaries will be submitted separately.

3 Cl 8-C24 and C18-C26 blends (even cation numbers) were tested.

4 Robust Summaries will not be submitted; summaries are available in the OECD SIDS dossier for 1-tetradecene.

5 Result questionable because EC50 value is above the water solubility.

6 Some concentrations tested were above water solubility and too few concentrations used to consider high quality data.

Table 6. Existing Data for Higher Olefins (Continued)

(Robust summaries for these studies will be submitted separately)

Internal Oletins																
		Human Health Effects						Ecotoxicity			Environmental Fate				
Chemical Name	CAS #	Acute Toxicity	Genetic Point Mutation	Genetic Chrom. Aberr.	Sub-chronic	Develop-mental	Reproduction	Acute Fish	Acute Invert.	Algal Toxicity	Physical Chem	Photo-degradation	Hydro-lysis	Fugacity	Biodegradation
Alkenes, C6	68526-52-3 (60-74% branched)		√	√				√							√
C7-rich Alkenes, C6-8,	(60-74% branched)	√		√											
Alkenes, C7-9, C8-rich	68526-54-5 (60-74% branched)	√						√							√
Alkenes, C8-10, C9-rich	68526-55-6 (60-74% branched)	√	√	√											
Alkenes, C9-11, C10 rich	68526-56-7 (60-74% branched)							√							√
Alkenes Cl 1-13, C 12-rich	68526-58-9 (60-74% branched)	√						√							√
Alkenes, C12-14, Cl3 Rich	68526-58-9 (60-74% branched)														√
C16/C18	Various (20-30% branched)	√[1]			√[2]			√[3]							√[3]
C20-24	various (appmx. 40% branched)	√	√	√	√			√	√	√					√
C24-30	Various (appmx. 40% branched)	√	√												√

√ Adequate existing data available

1 C16 and Cl8 tested separately.

2 54% C16, 38% C18, 8% C20, 2% linear alpha, 72% linear internal, 26% branched.

3 50% C16 and 50% C18

Table 7: Health Effects of C6-54 Alkenes

	Acute Toxicity	Repeated Dose	Mutagenicity In Vitro	Mutagenicity In Vivo	Repro/Dev
C 6	Oral: Rat LD50>5600 mg/kg and >10,000 mg/kg [1-hexene]; >5000 mg/kg [neohexene] Inhalation: Rat LC50 (4hr) = 32,000 ppm (nom) [1 -hexene]; >5 1,000 ppm [neohexene]	1 -hexene Rat, 90day inhalation OECD 4 13; NOEL= 1000 ppm Rat, 28day gavage OECD 407; NOEL= 10 1 mg/kg (gastric effects [males and females] and reduced body weights [males only]) Rat oral OECD 421; NOEL <100 mg/kg (general tox -male rat nephropathy)	1-hexene: *S. typhimurium*, OECD 47 1 w/out repeat assay; Mouse Lymphoma, OECD 476, Mammalian Ceil gene mutation ; CHO and Human lymphocytes-Metaphase Chromosome Analysis, OECD 473. All negative with and w/out activation UDS-rat hepatocyte; OECD 482; Negative at 0.5 and 2 mg/ml; no evaluation at 3.5 and 5.0 mg/mL due to toxicity. BALB/3T3 cells transformation: Negative neohexene: *S. typhimurium*, OECD 47 1 w/out repeat assay and CHO SCE, OECD 479, negative with and w/out activation; Mouse Lymphoma Mammalian Cell gene mutation, OECD 476, weakly positive w/out S9 w/out dose response Alkenes, C6 (internal branched stream): *S. typhimurium*, OECD 471, negative with and w/out activation	1-hexene and alkenes, C6 (internal branched stream): Mouse Bone Marrow micronucleus, OECD 474 (inhln); negative at 0, 1000, 10000 and 25000 ppm [1-hexene] and 1000 ppm [alkenes, C6] Alkenes, C6 (internal branched stream): Mouse Bone Marrow micronucleus, OECD 474 (oral); weakly positive at 5 g/kg	1 -hexene Rat; OECD 42 I ; doses at 0, 100, 500, and 1000. NOEL=> 1000 mg/k (reproductive tox, parental, adult female); NOEL => 1 OOOmg.kg (reproductive tox, F1 generation); NOEL=> 1000 mg/k (Pregnancy litter); NOEL=> 1000 mg/k (foetal data)
c 7	Alkenes, C6-8, C7 rich (internal branched stream): Inhalation: Rat, mouse and guinea pig LC50 (6hr) >42.3 mg/L Dermal: Rabbit LDSO >3 160 mg/kg (24 hr)			Alkenes, C6-8, C7 rich (internal branched stream): Mouse Bone Marrow micronucleus, OECD 474 (oral); negative	
C8	Oral: Rat LD50> 10g/kg and >5 ml/kg [1 -octene]; >5g/kg [alkenes., C7-9, C8 rich internal branched stream] Inhalation: Rat LC50 (4 hr) = 8,050 ppm (nom) [1 -octene]; rat and mouse LC50 (6	1 -octene Rat, 90 day oral (gavage) dosing at 0,5,50 or 500 mg/kg/bw - NOEL = 50 mg/kg/day increased kidney weights and decreased plasma chloride in both sexes	-octene: *Styphimurium* and BALB/c-3T3 transformation: Negative with and w/out activation Two CHO chromosome abberrations		

	hr) > 3 1.7 mg/L and guinea pig LC50 (6 hr) < 3 1.7 mg/L [alkenes, C7-9, C8 rich internal branched stream] Dermal: Rabbit LD50 >10 g/kg (24 hr) and 1.43 g/kg (24 hr) [1-octene]; >3.16 g/kg (24 hr) [alkenes, C7-9, C8 rich internal branched stream]		tests; one was negative with and w/out activation and the other had questionable results with activation; (aberration rate increased approx 2-fold over background, but no dose response) and was negative w/out activation.		
c 9	Alkenes, C8-10, C9 rich (internal branched stream): Oral: Rat LD50>2332 m&g Inhalation: rat LC50 (6 hr) > 1 1.1 mg/L Dermal: Rabbit LD50 >2332 m&g (24 hr)		Alkenes, C8-10, C9 rich (internal branched stream): *S.typhimurium* OECD 47 1: Negative with and w/out activation	Alkenes, C8-10, C9 rich (internal branched stream): Mouse Bone Marrow micronucleus, OECD 474 (oral); negative at doses of 1.25, 2.5 and 5 g/kg	
C10	1 -decene Oral: Rat LD50> 10g/kg Inhalation: Rat LC50 >saturation conc for 1 and 4 hr exposure at saturation of 9.3 and 8.7 mg/L Dermal: Rabbit LD50 > 10 g/kg (24 hr)		1 -decene. *S.typhimurium*; OECD 47 1; Negative with and w/out activation		
C12	Oral: Rat LD50>7.7 g/kg, >10 g/kg and > 1 0g/kg [I dodecene]; >7.74 g/kg [alkenes, Cl I-13, Cl2 rich internal branched stream] Inhalation: Rat LC50 (4 hr) > 2. I mg/l [CIO-13 AO]; (lhr) >9.9 mg/L [C12, 14, 16 linear AO blend]; rat, mouse and guinea pig LC50 (6 hr) > 4.4 mg/L [alkenes, Cl 1-13, Cl2 rich internal branched stream] Dermal: Rat LD50 > 3.04 g/kg [C10-13 AO blend] and >10 g/kg [1 dodecene]; rabbit LD50 >2446 mg/kg (24 hr) [alkenes, Cl I-13, Cl2 rich internal branched stream]	C12, 14, 16 linear AO blend: Dermal: Rabbit; 9 applications (6 hr) over 2 wk period of 1 or 2 g/kg; severe irritation and decrease in bodyweight seen with 2 g/kg; slight irritation seen with 1 g/kg;	*S. typhimurium* and *E.coli* [blend of Cl 1-12 AO[3]; Idodecene]; CHO/HGPRT [blend of C12, Cl4 and C 16 linear AO]; *S. cerevisiae* Mitotic Gene conversion Assay [Cl 1-12 AO blend and Idodecene]: All negative with and w/out activation CA Rat liver RL1 cells [Idodecene], CA Rat liver RL4 cells [Cl 1-12 AO blend]; BALB/c-3T3 Mouse embryo and UDS [C12, 14, 16 linear AO blend]: All negative	C 12, 14, 16 linear AO blend: Mouse Micronucleus Bone Marrow Test (dermal); No remarkable clinical findings-negative at doses of 1000.2500 and 5000 mg/kg for 2 days	
C14	Oral: Rat LD50 17.3 g/kg [C10-14 AO] and >10g/kg [C12-14, C14-18, C14-16 AO]; Mouse LD50= 21.3 g/kg [CIO-14 AO] Inhalation: Rat LC50 (1 hr) = 9900 mg/m^3 [C 1 2, 14, 16 linear AO blend]; Mouse LC50 = 223 mg/L [C10-14 AO blend] Dermal: Rat LD50 >10 g/kg [C12, 14, 16	1-tetradecene: Combined OECD 422; rat; gavage dosed at 0, 100,500 or 1000 mg/kg/bw/day for up to 5 1 days. NOAEL = 100 mg/kg/day liver effects in non-pregnant female satellite group and no NOEL for males due to kidney effects C12, 14, 16 linear AO blend: Dermal: Rabbit; 9 applications (6 hr) over 2 wk period of 1 or 2 g/kg; severe irritation	C13-14 AO blend: *S. typhimurium*, S. *cervisiae* Mitotic recombination with and w/out activation; CA Rat Liver RLI cells: Negative C12, 14, 16 linear AO blend: UDS (rat hepatocyte), CHO HGPRT and BALB/c-3T3: Negative	*C12, 14, 16 linear AO blend:* Mouse Micronucleus Assay (dermal); Negative at doses of 1000, 2500 and 5000 mg/kg for 2 days.	1-tetradecene: Rat; Modified OECD 422; gavage at 0. 100,500 or 1000 mg/kg/bw/day for up to 5 I days; NOAEL parental: 1000 mg/kg/bw/day; NOAEL F1 Offspring; 1000

	linear AO blend; C12-14 AO blend; C14-18 AO blend, and C14-16 AO blend]	and decrease in bodyweight seen with 2 g/kg; slight irritation seen with 1 g/kg;			mg/kg/day No developmental effects seen through day 4 of lactation
C16	Oral: Rat LD50 >10g/kg [1-hexadecene] and >5050 mg/kg [Cl6 internal linear and branched] Inhalation: Rat LC50 = 6.4 mg/l (4hr) and >8.5 mg/l (1 hr) [I-hexadecene] Dermal: Rabbit LD50 >2020 mg/kg (24 hr) [Cl 6 internal linear and branched]	C 16- 18 internal linear and branched: Oral: OECD 407; rat; dosed at 0, 25, 150 or 1000 mg/kg/bw/day for up to 4 wks. NOAEL = 1000 mg/kg/day C12, 14, 16 linear AO blend: Dermal: Rabbit; 9 applications (6 hr) over 2 wk period of 1 or 2 g/kg; severe irritation and decrease in bodyweight seen with 2 g/kg; slight irritation seen with 1 g/kg	1-hexadecene: *S. typhimurium*: Negative with and w/out activation C12, 14, 16 linear AO blend: UDS (rat hcpatocyte) and BALB/c-3T3: Negative	1-hexadecene: Mouse Micronucleus Assay (oral); Negative at 7.85 g/kg (only dose administered). C12, 14, 16 linear AO blend: Mouse Micronucleus Assay (dermal); Negative at doses of 1000, 2500 and 5000 mg/kg for 2 days.	
C18	Oral: Rat LD50 >10g/kg [C14-18 AO blend, C IS-26 AO blend, C 18-24 AO blend] and >5050 mg/kg [C18 internal linear and branched] Dermal: Rabbit LD50 >10 g/kg (24 hr) [C1 8-24 AO blend, C 18-26 AO blend] and >2020 mg/kg (24 hr) [C 18 internal linear and branched]	C16-18 internal linear and branched: Oral: OECD 407; rat; dosed at 0.25, 150 or 1000 mg/kg/bw/day for up to 4 wks. NOAEL = 1000 mg/kg/day	1-octadecene: *S. cervisiae* Mitotic gene conversion and *S. typhimurium* with and w/out activation; CA Rat Liver RL1 cells: Negative		
C20-24	Oral: Rat LD50 >5 g/kg [C20-24 linear AO, C20-24 internal linear and branched, and C22-28 linear AO] and >15 g/kg [C20-24 linear AO] Dermal: rat LD50 >5 ml/kg (24 hr) [C20-24 linear AO] and >2 g/kg [C20-24 internal linear and branched]	C20-24 internal linear and branched: Combined OECD 408; rat gavage dosed at 0, 100,500 or 1000 mg/kg/bw/day for 90 days. NOAEL = 1000 mg/kg/day	C20-24 internal linear and branched: *S. typhimurium* OECD 47 1; and CA human lymphocytes: Negative with and w/out activation	C20-24 internal linear and branched: Mouse Micronucleus Assay (i.p.): Negative at doses of 500, 1000 and 2000 mg/kg	
C24-28	C24-28 internal linear and branched: Oral: Rat LD50 >5 g/kg		C24-28 internal linear and branched: *S. typhimurium* OECD 47 I: Negative with and w/out activation		
C24-54 (C30+)	C24-54(C30+) AO linear and branched: Oral: Rat LD50 >2 g/kg and >15 g/kg Dermal: rat LD50 >5 ml/kg (24 hr)				

Table 8. Assessment Plan for Higher Olefms Category Under the Program
(Robust summaries for existing studies will be submitted separately.)

Alpha Olefins															
		Human Health Effects						Ecotoxicity			Environmental Fate				
Chemical	CAS #	Acute Toxicity	Genetic Point Mut.	Genetic Chrom.	Sub-chronic	Develop-mental	Reproduc-tion	Acute Fish	Acute Invert.	Algal Toxicity	Physical Chem.	Photo-deg.	Hydro-lysis	Fugacity	Biodeg.
I-Hexene (SIDS)	592-41-6 Linear	√	√	√	√	√	√	√	√	√					√
Neohexene	558-37-2 Branched	√	√	√	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
1-Tetradecene (SIDS)	1120-36-1 Linear	√	√	√	√	√	√	√	√	√				√	√
1-Tridecene	2437-56-1 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
1-Hexadecene (ICCA)	629-73-2 Linear	√	√	√	RA	RA	RA	√	RA	√	SAR	TD	TD	CM	√
1-Octadecene (ICCA)	112-88-9 Linear	√	√	√	RA	RA	RA	√	√	√	SAR	TD	TD	CM	√
Alkenes, C 10-1 6 alpha (even carbon numbers)	68855-58-3 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
Alkenes, C14-18 alpha (even carbon numbers)	68855-59-4 Linear	√	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
Alkenes, C14-20 alpha (even carbon numbers)	68855-60-7 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
1 -Eicosene	3452-07-1 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
1-Docosene	1599-67-3 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
1-Tetracosene	10192-32-Z Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
a-olefin fraction C20-24 cut (even numbers)	93924-10-g Linear	√	RA	RA	RA	RA	RA	√	RA	√	SAR	TD	TD	CM	RA
a-olefin fraction C24-28 cut (even carbon numbers)	93924-11-9 Branched and Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
alkene, C24-54 branched and linear, alpha (even numbers)	131459-42-2 Branched and Linear	√	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA

√ Adequate existing data available
CM Computer Modeling proposed
TD Technical discussion proposed
SAR Structure Activity Relationship
RA Read Across (see Sec. IV & VI)
T Proposed Testing

Table 8. Assessment Plan for Higher Olefms Category Under the Program (Continued)
(Robust summaries for existing studies will be submitted separately.)

Internal Olefins															
		Human Health Effects						Ecotoxicity			Environmental Fate				
Chemical	C A S #	Acute Toxicity	Genetic Point Mut.	Genetic Chrom	Sub-chronic	Develop-mental	Reproduc-tion	Acute Fish	Acute Invert.	Algal Toxicity	Physical Chem.	Photo-deg.	Hydro-lysis	Fugacity	Biodeg.
Alkenes, C6	68526-52-3 Br. and Lin.	RA	√	√	T	T	T	√	T	T	SAR	TD	TD	CM	√
Hexene (ICCA)	25264-93-1 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	C M	RA
Alkenes, C6-8, C7 rich	68526-53-4 Br. and Lin.	√	RA	√	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	R A
Heptene (ICCA)	25339-56-4 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	T D	C M	RA
Octene (ICCA)	25377-83-7 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	T D	C M	RA
Alkenes, C7-9, C8-rich	68526-54-S Linear or Br. and Lin.	√	RA	RA	RA	RA	RA	√	RA	RA	SAR	TD	TD	CM	√
Nonene (ICCA)	27215-95-8 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	C M	R A
Alkenes, C8-10, C9-rich	68526-55-6 Linear or Br. and Lin.	√	√	√	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
Alkenes, C9-11, C10-rich	68526-56-7 Linear or Br. and Lin.	RA	RA	RA	RA	RA	RA	√	RA	RA	SAR	TD	T D	CM	√
C10,12 Olefinrich hydrocarbons	68514-32-9 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	R A
Alkenes, C10-12, Cl l-rich	68526-57-8 Br. and Lin.	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA

√ Adequate existing data available
CM Computer Modeling proposed
T D Technical discussion proposed
SAR Sbucture Activity Relationship
R A Read Across (see Sec. IV & VI)
T Proposed Testing

Table 8. Assessment Plan for Higher Olefms Category Under the Program (Continued)
(Robust summaries for existing studies will be submitted separately.)

Internal Olefins (continued)																
		Human Health Effects						Ecotoxicity			Environmental Fate				
Chemical	CAS #	Acute Toxicity	Genetic Point Mut.	Genetic Chrom.	Sub-chronic	Develop-mental	Reproduc-tion	Acute Fish	Acute Invert.	Algal Toxicity	Physical Chem.	Photo-deg.	Hydro-lysis	Fugacity	Biodeg.
Alkenes, C11-13, C12-rich	68526-58-9 Linear or Branched or Br. and Lin.	√	RA	RA	RA	RA	RA	√	RA	RA	SAR	TD	TD	CM	√
Dodecene (ICCA; not sponsored in HPV)	25378-22-7 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
Heavy polymerization naphtha (petroluem)	68783-10-8 Branched	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
C12,14 Olefin rich hydrocarbons	68514-33-0 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
Alkenes, C10-16	68855-58-3 Linear	RA	RA	RA	RA	RA	RA	RA	RA	RA	SAR	TD	TD	CM	RA
Alkenes, C15-C18	93762-80-2 Linear	RA	RA	RA	RA	RA	RA	√	√	√	SAR	TD	TD	CM	RA
Octadecene (Not HPV and not sponsored under HPV; data used to support category)	Various Branched and Linear	√			√	T	T	√	√	√					√
C20-24 (Not HPV and not sponsored under HPV; data used to support category)	Various Branched and Linear	√	√	√	√			√	√	√					√

√ Adequate existing data available
CM Computer Modeling proposed
TD Technical discussion proposed
SAR Structure Activity Relationship
RA **Read Across (see Sec. IV & VI)**
T **Proposed Testing**

AR201-13116B

Higher Olefins Category

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Robust Summaries

For

C6 – C54

Prepared by:

American Chemistry Council
Higher Olefins Panel

July 5, 2001

Table of Contents

CAS # 112-41-4
Green Algae Acute Tox study

Test Substance Dodecene-1, Neraten® 12, CAS# 112-41-4
Purity: carbon number C 12 more than 97%

Method/guide followed
Type (test type)
GLP No
Year 1997
Species/Strain Other Planctonal freshwater green algae Scenedesmus subspicatus from collection autotrofal organisms of Botanical Institute of AV CR. Algae build unicellular cultures.

Element basis 10000 cells per 1mL, area under the curve, exponential growth rate

Exposure period Duration of the test is 72hrs. The sample is taken and microscopically determined density of algae suspension as number of cells in 1 mL every 24hrs.

Statistical method Inhibition of algae growth in % was calculated as integral of biomass (area under growing curve) I_{ai}. The terminal inhibition of evaluation was done by software Toxicita VÚV Ostrava (199 1)

Remarks
Test Organism Algae inoculum is recovered for the test from exponential growing culture, which is gained by 3-day pre-cultivation. Cells density is measured imminently before the start of the test and is counted necessary volume of inoculum, corresponding 10000 cells per 1mL. Every concentration set has control tests without tested matter. Sensitivity of algae culture and accuracy the test execution is checked by testing of standard material (potassium dichromate p.a.).

Test Conditions Test temperature range 2 1-25°C, pH of solutions 7,70
Dilution water Un-watered standard nutrient medium for algae cultivation, prepared by mixing ofreserve solutions A, B, C, D in volume 100,10,10,10 and complementing to 1L by distilled water.

Reserve solution A:

NH_4Cl	1,5g
$MgCl_2.6H_20$	1,2g
$CaCl_2.2H_20$	1,8g
K_2HPO_4	0,16g

in 1 L distilled water

Reserve solution B:

$FeCl_3$.$6H_20$	80mg
$Na_2EDTA.2H_20$	100mg

in 1 L distilled water

Reserve solution C:

H_3BO_3	185mg
$MnCl_2$	415mg
$ZnCl_2$	3mg
$CoCl_2.6H_20$	1,5mg
$CuCl_2.2H_20$	0,01mg
$Na_2Mo0_4.2H_20$	7mg

in l L distilled water

Reserve solution D:

NaHC03	50g

in 1L distilled water

Diluting water was obtained by ten times diluting of un-watered solution of nutrient.

Equipment

Agitator LT-2, pHmeter WTW-pH 539, fluor tube of universal white light of range 6000- 1 0000lux, microscope, Burker's computing chamber, equipment for microfiltration, filters Synpor with pores 0,2um, bulbs, beakers, pipettes

Results

E_bC50 (0-72hrs)=15,4mg/l
Range of credibility: 14, 25-16,58
Used approximation function: multinominal 3.stage
Range of credibility is calculated for normal allocation and level of importance 95%.

ErC50 (0-72hrs) is not possible to determine

Remarks

Base solution 0,0183g/l diluting water.
Preliminary test:

Thinning	ml/l	1000	500	100	K
Concentration	mg/l	18,3	9,15	1,8	
Number of cells	Oh	10000	10000	10000	10000
Number of cells	72hrs	125000	156250	181250	193750

Base test I:

Thinning ml/l	1000	800	600	400	200	100	K
Concentration mg/l	18,3	14,6	10,9	7,3	3,7	1,8	0
Number of cells/ml (0hr)	10000	10000	10000	10000	10000	10000	10000
Number of cells/ml (72hrs)	18750	137500	143750	162500	181250	187500	206250
Inhibition I_{ai} %	69,3	42,6	35,6	26,7	13,8	10,9	0
Inhibition I_{ui} % 18,8	13,9	11,9	7,9	3,9	2,9	0	

Base test II:

Thinning ml/l	1000	800	600	400	200	100	K
Concentration mg/l	18,3	14,6	10,9	7,3	3,7	1,8	0
Number of cells/ml (0hr)	10000	10000	10000	10000	10000	10000	10000
Number of cells/ml (72hrs)	125000	131250	143750	168750	175000	175000	200000
Inhibition I_{ai} %	69,4	43,9	33,7	23,5	12,2	12,2	0
Inhibition I_{ui} %	16	14	11	6	5	5	0

Conclusions (study author)

The Dodecene- 1 is not toxic in the studied range of concentration.

Data Quality Reliability

Comment by Higher Olefms Panel: Because this study cites an effect (EC50) that was seen above the water solubility, the results are questionable.

References	Research Institute of Organic Synthesis a.s, Pardubice, Czech republic, test Protocol No. 28/L
Other	
Last changed	6-Feb-0 1 Robust summary prepared by a Spolana to the Panel. 1 O-May-O 1 by Panel

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CAS # 131459-42-2
Acute Oral

Test Substance	Alpha-olefin fraction C30+, CAS# 13 1459-42-2 Purity: carbon number C28 and lower max.28% carbon number C30+ min.72%

Method/guide followed

Type (test type)	Experimental.
GLP	No
Year	1990
Species/Strain	Conventional rats Wistar, weight 140-I 57g
Sex	Male/Female
No. of animals per sex per dose	1 O/male/dose 1 O/female/dose
Vehicle	
Route of admin	Olive-oil; per oral, dispersion in olive-oil
Remarks	
Doses	15,85g/kg for both sexes
Concentration	20% dispersion in olive-oil
Results	LD50 >15g/kg No deaths in male or female group
Remarks	Rats were without distinct signs of intoxication after application. There was noted normal weight increase during 14-days of observation period. Rats were euthanased and dissected. Any macroscopically observable changes on organs were not found.
Conclusions (study author)	The sample is nontoxic
Data Quality Reliability	
References	Research Institute of Organic Synthesis a.s, Pardubice, Czech Republic, Test No. T2103

Other
Last changed 6-Feb-01
Robust summary prepared by a Spolana to the Panel.

CAS # 131459-42-2
Acute Dermal

Test Substance Alpha-olefin fraction C30+, CAS# 13 1459-42-2
Purity: carbon number C28 and lower max.28%
carbon number C30+ min.72%

Method/guide followed
Type (test type) Experimental
GLP **No**
Year 1990
Species/Strain Conventional rats Wistar, weight 240-3 12 g
Sex Male

No. of animals per sex per dose 5 rats per group

Route of admin dermal application

Remarks
Doses 5ml/kg
Sample was applied at quantity 5ml/kg, on the shaved skin, area 4 x 6cm onto the rats back. The sample was in contact with skin for 24hrs, fixed by gauze, aluminum foil and plaster bandage, so that the animals were able freely to move and couldn't eat the sample. The bandage was removed after 24hrs. Rats were observed next 14-days. Rats were sequentially weighted, euthanased, dissected and organs were macroscopically looked-over.

Results LD50 >5ml/kg
No deaths in group

Remarks Any clinical signs of intoxication at animals in the course of the test were not noted. There was normal body weight increase. Any macroscopic patomorfological changes during the dissection were not found.

Conclusions (study author) The fraction C30+ is not absorbed in toxic quantity

Data Quality
Reliability

References Research Institute of Organic Synthesis a.s, Pardubice, Czech Republic, Test No. T2103

Other

Last changed 6-Feb-0 1
Robust summary prepared by a Spolana to the Panel.

CAS # 93924-10-g
Acute Oral

Test Substance Alpha-olefin fraction C20-24, CAS# 93924-l O-8

Purity: carbon number C 18	max.5%
carbon number C20	45-60%
carbon number C22	30-50%
carbon number C24	max.15%
carbon number C26	max.1%

Method/guide followed

Type (test type) Experimental.
GLP No
Year 1990
Species/Strain Conventional rats Wistar, weight 140- 160g
Sex Male/Female

No. of animals per sex per dose 10/male/dose
1 O/female/dose

Vehicle Olive-oil
Route of admin per oral, dispersion in olive-oil

Remarks
Doses 15,85g/kg for both sexes
Concentration 20% dispersion in olive-oil

Results LD50 >15g/kg
No deaths in male or female group

Remarks Rats were without distinct signs of intoxication after application. There was noted normal weight increase during 14-days of observation period. Rats were euthanased and dissected. Any macroscopically observable changes on organs were not found.

Conclusions (study author) The sample is nontoxic

Data Quality
Reliability

References Research Institute of Organic Synthesis a.s, Pardubice, Czech republic, Test No. T2102

Other
Last changed 6-Feb-0 1
Robust summary prepared by a Spolana to the Panel.

CAS # 93924-10-8
Acute Dermal

Test Substance	Alpha-olefm fraction C20-24, CAS# 93924-10-8
	Purity: carbon number C 18 **max. 5%**
	carbon number C20 **45-60%**
	carbon number C22 **30-50%**
	carbon number C24 max. 15%
	carbon number C26 max.1%

Method/guide followed

Type (test type)	Experimental.
GLP	**No**
Year	1990
Species/Strain	Conventional rats Wistar, weight 270-3 12 g
Sex	Male
No. of animals per sex per dose	5rats per group
Route of admin	dermal application

Remarks
Doses 5ml/kg
Sample was applied at quantity 5ml/kg, on the shaved skin, area 4 x 6cm onto the rats back. The sample was in contact with skin for 24hrs, fixed by gauze, aluminum foil and plaster bandage, so that the animals were able freely to move and couldn't eat the sample. The bandage was removed after 24hrs. Rats were observed next 14-days. Rats were sequentially weighted, euthanased, dissected and organs were macroscopically looked-over.

Results LD50 >5ml/kg
No deaths in group

Remarks Any clinical signs of intoxication at animals in the course of the test were not noted. There was normal body weight increase. Any macroscopic patomorfological changes during the dissection were not found.

Conclusions (study author) The fraction C20-24 is not absorbed in toxic quantity

Data Quality Reliability

References	Research Institute of Organic Synthesis a.s, Pardubice, Czech Republic, Test No. T2102
Other	
Last changed	6-Feb-01 Robust summary prepared by a Spolana to the Panel.

CAS # 629-73-2
Genetic Toxicity - in Vitro

Test Substance	Alpha-olefin fraction C 16, CAS# 629-73-2 Purity: 1-hexadecene min. 90,6% Vinylidenes max. 7,5% internal olefins max. 2% paraffins max. 1,5%
Method/guideline Followed	Mar-on, Ames Assay
Type	gene mutation test
System of testing	Bacterial
GLP	No
Year	1990
Species/Strain	*Salmonella* typhimurium/ TA97A, TA98, TA100.
Metabolic activation	With and without.
Species and cell type	Rat liver S9 mix
Quantity	20 ul/plate.
Induced or not induced	Delor 105 -induced
Concentrations tested	0, 10, 20, 50, 100,200 ul/plate.
Statistical Methods	The two-fold increase modified rule was used for evaluation results. Positive response was defined as dependency between dose and influence or when ratio Rt/Rc is 2 or more.
Remarks for Test Conditions	All tests included positive and negative checking. As negative checking was used TWEEN80. Negative checking was compared with historical values of spontaneous reversion, that was found in lab before (TA97A:94-98,TA98:5-33,TA1OO:88-172). Positive checking was done to check indicating strain sensitivity to standard mutagens and to check efficiency of activating system. All strains was checked also to requested genotyp (uvr mutation, presence plazmid 10 1 ,rfa mutation). Sample was tested 2 times independent of every strains. Three plates were used per every dose level.
Results	
Genotoxic effects	Negative

1 -hexadecene was not mutagenic in any of the three strains of Salmonella. The sample mutagenity is decreasing with metabolic activation.

Conclusions (contractor) Negative

Data Quality Reliabilities 2 – Reliable with restrictions. TA1535 was not tested.

Reference Research Institute of Organic Synthesis a.s, Pardubice, Czech republic, T2 129

Other
Last changed 20-Aug-00
Robust summary prepared by Spolana to the Panel.
1 O-May-O 1 by Panel

CAS # 629-73-2
Genetic Toxicity - in Vivo

Test Substance	Alpha-olefin fraction Cl 6, CAS# 629-73-2 Purity: 1 -hexadecene min. 90,6% Vinylidenes max. 7,5% internal olefins max. 2% paraffins max.1,5%
Method/guideline Followed	Micronucleus test
Type (test type)	In vivo, assay is detecting genetic influence on the chromozome level
GLP	No
Year	1990
Species/Strain	Mouses, 5 male in separate group, 5 female in separate group
Strain	Randombred strain ICR-SPF (Velaz Prague)
Sex	Male/Female
Route of admin	Peroral, by probe to the maw
Doses/concentration	7,85g/kg body weight/ same for both sexes
Exposure period	72hrs
Statistical method	Statistical evaluation was done according tables of mutation frequencies (Kastenbaum and Bowman, 1970)

Remarks

Age at study initiation	8-12weeks
No. animals per dose	5 male, 5 female in the separate groups
Vehicle	Raw sample without dilution
Duration of test	72hrs

Frequency of treatment

Cytogenetic influence was evaluated in 24,48 and 72hrs interval for tested groups and after 48hrs for positive control groups

Control groups

There were two positive control groups (male/female), 5 animals per group, control substance was benzene, dose 2g/kg and 4g/kg
There were concurrent negative control group with olive oil for 48 hrs period.

Test Conditions

The varnish based on suspension bone marrow cell of was coloured by Giemsa. The occurrence of micronucleus was counted in 1000 of PCE on every animal. The quantity of polychromatic and monochromatic forms was observed for 200 erythrocytes at every animal. Declining of percentage PCE indicates the toxic influence of 1-hexadecene to bone maw cell

The maximum admissible dose was searched at first. The survival was observed for 72hrsperiod. The sample was applied at volume 0, 1ml per 10 g of animal weight, There was not observed any toxic influence, so dose was determined by physical properties of I-hexadecene.

Results

Sex	Dose g/kg	Interval hrs	No.PCE	PCE with microcell/ 1 OOOPCE		PCE/(PCE+NCE)
				x“	sx	(%)
Male	7,85	24	-5000	1,4	2,2	45,0
		48	5000	1,8	1,6	45,0
		72	5000	l,o	1,2	48,1
	olive oil	48	5000	1,2	0,8	48,6
Female	7,85	24	5000	1,2	1,1	48,3
		48	5000	0,8	1,1	43,3
		72	5000	0,8	0,8	42,9
	olive oil	48	5000	06	0,9	49,3

Conclusions (study author)

The result of micronucleus test was negative. 1 -hexadecene in dose 7,85g/kg body does not create cytogenetic damage mouse bone maw cells.

Data Quality Reliability

2-reliable with restrictions (no GLP)

References

Research Institute of Organic Synthesis a.s, Pardubice, Czech republic, T2 129

Other Last changed

6-Feb-01
Robust summary prepared by a Spolana to the Panel.
1 O-May-O 1 by Panel

CAS # 629-73-2
Acute Inhalation

Test Substance	Alpha-olefin fraction Cl 6, CAS# 629-73-2 Purity: 1 -hexadecene min. 90,6% Vinylidenes max. 7,5% internal olefins max. 2% parafins max. 1,5%
Method/guideline followed	Method RIOS Pardubice based on OECD test guidelines 403
Type (test type)	
GLP	No
Year	1991
Species/Strain	Conventional rats Wistar, weight 16 1-266g
Sex	Male/Female
No. of animals per sex per dose	10/5male+5 female/dose
Vehicle	
Route of admin	air, type equipment head only with continual change of aerosol, 0.66m3/hr inhalation -aerosol
Remarks	
Doses	8 groups.were tested. One of them was checking. Every group was tested only by one concentration. Doses 2.37, 3.29, 4.00, 4.88, 5.75, 6.64,7.68 mg/l was used.
Doses per time period	Inhalation of tested sample for 4hrs (One group/one concentration). Rats that died during application were immediately dissected and were taken samples for histopatology evaluation(HE). During 14 days after application were rats observed 2times per day in 4hrs interval. Rats were euthanased , dissected and sample for HE was taken. Rats were weighted at 7 and 14 day.

Results

LC50 =6,359 g /m^3

Concentration (mg/l)	Occurrence of pathological signs (M/FM)	Number of deaths (M/FM)	Time of death (min)
2,37	10 (5/5)	0	
3,29	10 (5/5)	2 (2/0)	76M,182M
4,00	10 (5/5)	2 (1/1)	45FM,until 16hrs M
4,88	10 (5/5)	2 (2/0)	43M,50FM
5,75	10 (5/5)	4 (2/2)	78FM,195FM,5 after finish of appl., unt 16hrsM
6,64	10 (5/5)	4 (3/1)	45M,143M,

	7,68	10 (5/5)	8 (4/4)	unt.16hrs M+FM 48FM, 59M+FM, 70M+FM, 192M, until 16hrs M+FM

Remarks

Time of deaths, time of starts of toxic signs, their intensity and normalization to the previous state during observation period weren't definitly depending on applied dose. Animals were without toxic signs 24hrs after application only by dosing 2,37g/m3. The fixation of rats and exposition to the higher air-flow cause only slight eye-lid turgidity connected with mild flux form nose and eyes. The findings on the organs after sample application were not very different at histopathology exploration in dependence on the dosing and sex. The 1-hexadecene inhalation causes mainly changes in the expiratory tract. It means the picture of acute hypertension, which causes in higher concentrations suffocation, due to lungs congestion and lower gas change in the pulmonary nick. In the lower concentrations this acute hypertension causes blood permeation to the expiratory ways and fibrin you-precipitation out of blood ways in the agony stadium. The lower oxygen change in the lunge causes higher air change and sequential emphyzema creation. The signs of the suffocation was also observed on the thym. Aforementioned changes were gradually normalized and the picture of expiratory tract was in physiological state after 14days. Hyperemion in the splanchen area was only at average doses (4.0,4.88g/m3), at higher levels blood stagnation was noted in the lungs.
There was not difference in liver steatoza between tested rats and controls.

Conclusions (study author)

The sample unsatisfied to the limit test No.403 OECD. Based on done exposition LC50 6,359 (5,502-7,337) g/m3 at laboratory rats by Bliss method was determinated. 1-hexadecene causes acute hypertension accompanied by hemorrhage to the lungs from concentration 3,29g/m3. The reason of death is failure of blood circulation.

Data Quality Reliability

References

Research Institute of Organic Synthesis a.s, Pardubice, Czech republic, Test No. T2219

Other

Last changed

6-Feb-0 1
Robust summary prepared by a Spolana to the Panel.

CAS No. 112-88-9
Daphnia

Test Substance	CAS No. 112-88-9; C 18 linear alpha olefin (1-Octadecene)
Remarks	Source: Shell Chemicals UK Ltd., Stanlow. Stability during use confirmed by infra-red spectra. Density - 0.788 kg/L @ 20°C. Clear, colorless liquid.
Method/guideline	Similar to OECD 202
Test type	48 h aqueous toxicity test (static)
GLP	yes
Year	1985
Species/Strain	*Daphnia magna*
Supplier	Strain obtained from I.R.Ch.A., France
Test details	static toxicity test without renewal
Statistical methods	no specifics noted
Test Conditions	Quantities of 1 -Octadecene were added to 140-mL flasks so that when brought to 140 ml final volume with a reconstituted freshwater, nominal concentrations equaled 100, 200, 500 and 1000 mg 1-Octadecene/L. Flasks were prepared in triplicate and three flasks served as untreated laboratory controls. Ten *Daphnia magna* (less than 24 h old) were placed in each test flask. To minimize the risk of these organisms becoming trapped at the surface, black plastic caps were placed just beneath the water surface to create a darkened zone that *D. magna* would avoid. The numbers of immobilized *D. magna* were recorded after 24 and 48 hours. Test temperatures ranged between 18-22°C, pH ranged from 7.8 to 8.0 s.u. and dissolved oxygen concentrations ranged between 8.6 and 9.0 mg/L. The total hardness of the reconstituted laboratory water was 170 mg/L as $CaCO_3$.
Results	Less than 4% of the *D. magna* exposed to the highest nominal concentration (1000 mg/L) were immobilized after 48 h. Therefore, the 48 h EC50 was > 1000 mg/L.
Remarks	Concentrations of 100, 200, 500, and 1000 mg 1-Octadecene/L were not completely soluble and were visible at the surface as floating globules.
Conclusions	The acute toxicity of C 18 linear alpha olefin to the crustacean zooplankter, *Daphnia magna,* was determined in a static aqueous toxicity test. Less than 4% of *D. magna* were immobilized during 48 h exposure to 1000 mg/L of the olefin, the highest concentration tested. The 24 and 48 h EC50 values were therefore both greater than 1000 mg/L.
Data Quality	Reliability: 3; Not reliable
References	Pearson N. (1985). C 18 Linear Alpha Olefin (1-Octadecene): Acute Toxicity (*Salmo gairdneri, Daphnia magna and Selenastrum capricornutum)* and n-octanol/water coefficient. Shell Research Limited, Sittingboume Research Center. Shell Report # SBGR.85.059.

CAS No. 112-88-9
GENETIC TOXICITY - IN VITRO

Test Substance	SHOP C 18 linear alpha olefin (1-Octadecene) (CAS No. 112-88-9)
Remarks	Source: S.O.C., Houston, Texas. Stability during use confirmed by an nmr technique.
Method/guideline	Reverse Bacterial Mutation Assay; Similar to OECD 471
Type	Ames
System of testing	Bacterial
GLP	No
Year	1980
Species/Strain	Salmonella typhimurium strains TA 1535, TA 1537, TA 1538, TA 98, and TA 100. Escherichia coli strains WP_2 and WP_2 uvrA.
Metabolic activation	with and without S9 (from Arochlor induced rat liver)
Concentrations tested	0.2, 2.0, 20, 200 and 2000 µg/plate
Statistical Methods	Experiments were carried out in duplicate. Reproducible values of 2.5 X control value or greater are considered to indicate a mutagenic response.

Remarks for Test Conditions

Test Design	
Number of replicates	3 per concentration
Solvent	acetone
Temperature	37°c for 48 hours
	Positive control materials: 20 µg/plate of 4-nitroquinoline-N-oxide, sodium azide, or benzo(a)pyrene [these materials demonstrated positive mutagenic responses]
Result	negative
Cytotoxic concentration	Concentrations used were not reported as cytotoxic.
Remarks for Results	The addition of Alpha C 18 Product to agar layer cultures of the bacterial tester strains, with or without the incorporation of rat liver microsomal fraction, did not result in an increase in the reversion frequency in any of the strains.
CONCLUSIONS	The results indicate that Alpha C 18 Product did not induce mutation in bacteria.
DATA QUALITY	
Reliabilities	2c - comparable to guideline study with acceptable restrictions
REFERENCES	Dean BJ. Shell Chemicals Europe Ltd. (1980). Toxicity Studies with Detergent Intermediates: In Vitro Genotoxicity Studies with SHOP Process Intermediates. Shell Toxicology Laboratory (Tunstall). Shell Report # TLGR.80.074.

CAS No. 112-88-9
GENETIC TOXICITY - IN VITRO

Test Substance	SHOP Cl 8 linear alpha olefin (1-Octadecene) (CAS No. 112-88-9)
Remarks	Source: S.O.C., Houston, Texas. Stability during use confirmed by an nmr technique.
Method/guideline	Similar to OECD 48 1
Type	Mitotic Gene Conversion
GLP	No
Year	1980
Species/Strain	Saccharomyces cerevisiae JD 1
Concentrations tested	0.01, 0.1, 0.5, 1.0, and 5.0 mg/ml
Metabolic activation	with and without S9 (from Arochlor induced rat liver)
Statistical Methods	Experiments were carried out in duplicae. Reproducible values of greater than twice the control value are considered to indicate mutagenic response.

Remarks for Test Conditions
Test Design

Number of replicates	3 per concentration
Solvent	acetone
Positive control materials	cyclophosphamide (10 mg/ml) or 4-nitroquinoline-N-oxide (0.00 1 or 0.000 1 mg/ml) Liquid suspension cultures of Saccharomyces cerevisiae JD1 were dosed with 20 µl (without S9 mix) or 25 µl (with S9 mix) of appropriate solutions or suspensions of Alpha C 18 Product to give final concentrations of 0.0 1, 0.1, 0.5, 1 .0, and 5.0 mg/ml. Three replicate experiments were carried out and incubation periods of 1 h at room temperature for experiments without S9 and 1 or 4 h at 37°C in a shaking water bath in the presence of S9 were used. The mitotic gene conversion was calculated from counts of revertant colonies after 3 days incubation of the plate cultures at 30°C.
Result	negative
Cytotoxic concentration	Concentrations used were not reported as cytotoxic.
Remarks for Results	The addition of Alpha C 18 product to liquid suspension cultures of Saccharomyces cerevisiae JD 1, with or without the incorporation of rat liver S9 fraction, did not induce a consistent increase in mitotic gene conversion at either gene locus in three replicate experiments.
CONCLUSIONS	The results indicate that Alpha C 18 Product did not induce gene conversion in yeast

DATA QUALITY

Reliabilities 2c - comparable to guideline study with acceptable restrictions

REFERENCES Dean, BJ. Shell Chemicals Europe Ltd. (1980). Toxicity Studies with Detergent Intermediates: In Vitro Genotoxicity Studies with SHOP Process Intermediates. Shell Toxicology Laboratory (Tunstall). Shell Report # TLGR.80.074.

CAS No. 112-88-9
GENETIC TOXICITY - IN VITRO

Test Substance	SHOP C 18 linear alpha olefin (1-Octadecene) (CAS No. 112-88-g)
Remarks	Source: S.O.C., Houston, Texas. Stability during use confirmed by an nmr technique.
Method/guideline	*In Vitro* Mammalian Cell Chromosome Aberration
Type	Cytogenetic Assay
GLP	No
Year	1980
Cell type	Rat liver (RL_1) cells
Concentrations tested	0, 125, 250, 500 µg/ml as an acetone solution
Statistical Methods	no specifics noted. Positive responses indicated as higher frequency of chromosome damage as was seen with the positive control substance dimethylbenzanthracene (1 .0µg/ml)

Remarks for Test Conditions

Test Design	
Number of replicates	3 per concentration
Frequency of Dosing	continuous
Solvent	acetone
Positive control	dimethylbenzanthracene (1 .0µg/ml)

RL_1 slide cultures were exposed to culture medium containing the test materials at final concentrations equivalent to 0.5x, 0.25x, and 0.125x the concentration inhibiting cell proliferation by 50 % (GI_{50} concentration). After 24 h the culture were processed for chromosome analysis and where possible 100 cells were analyzed from each of three cultures per dose group.

Result negative

Cytotoxic concentration Concentrations used were not reported as cytotoxic.

Remarks for Results The concentration range of C 18 product that it was possible to test was restricted since the compound was insoluble in DMSO. However, reasonably high concentrations of the compound (500 mg/ml) were soluble in acetone. In preliminary cytoxicity studies, no toxic effects were observed in RL_1 cells up to a concentration of 500 µg/ml. Therefore 500 µg/ml alpha C 18 product was used as the highest dose in the subsequent chromosome assay. A single exchange figure

was observed on one culture treated with 250 µg/ml alpha C 18 product. However, since no dose related increase in the frequency of chromatid gaps, chromatid breaks or total chromatid aberrations was observed, it was concluded that alpha C 18 product did not induce a cytogenetic effect in cultured RL_1 cells.

CONCLUSIONS The results indicate that alpha C 18 product did not induce chromosome damage in rat liver cells.

DATA QUALITY
Reliabilities 2c - comparable to guideline study with acceptable restrictions

REFERENCES
Dean BJ. Shell Chemicals Europe Ltd. (1980). Toxicity Studies with Detergent Intermediates: In Vitro Genotoxicity Studies with SHOP Process Intermediates. Shell Toxicology Laboratory (Tunstall). Shell Report # TLGR.80.074.

CAS No. 112-88-9
ACUTE TOXICITY TO FISH

Test Substance CAS No. 112-88-g; C 18 linear alpha olefin (1-Octadecene)

Remarks Source: Shell Chemicals UK Ltd., Stanlow. Stability during use confirmed by infra-red spectra. Density - 0.788 kg/L @ 20°C. Clear, colorless liquid.

Method/guideline Similar to OECD 203
Type 96 h aqueous toxicity test (daily static renewal)
GLP yes
Year 1985
Species/Batch No./Supplier *Salmo gairdneri*/RT44/Zeals Fish Farm, Wolverton,Wiltshire
Exposure period 96 h
Statistical methods no specific methods noted

Test Conditions Fingerlings were obtained from Zeals Fish Farm (UK) and allowed to acclimate to test conditions for more than 10 days prior to exposure. Fish used for testing had an average mean length of 5.4 cm and a mean weight of 2.0 g. Five glass aquariums were obtained and tilled with 20 L of filtered (8 µm), dechlorinated laboratory water. Each exposure solution was prepared by adding known quantities of 1-Octadecene to four of the five test aquariums. This resulted in nominal concentrations of 0, 100, 200, 500, and 1000 mg 1-Octadecene/L. The aquarium with no 1 -Octadecene served as the untreated control. Ten *S. gairdneri*, previously acclimated to test water, were placed in each test chamber and exposed for 96 hours. Test concentrations were renewed daily. Test waters were gently aerated and organisms were not fed during the 96 hour exposure duration. Water temperatures were maintained between 13.5 and 16.5°C, while pH, hardness and dissolved oxygen ranged from 8.0-8.3 s.u., 220-280 mg/L as $CaCO_3$, and 8.8-10.4 mg/L, respectively

Results	Concentrations of 1-Octadecene were not wholly soluble at concentrations above 10 mg/L, however, exposure concentrations were expressed as the initial nominal concentration. No fingerling mortality was observed at any of the nominal exposure concentrations tested. Therefore, the 96 h LC50 was greater than 1000 mg/L.
Remarks	Tested at nominal 1000 mg/L concentration on loading. Concentrations of 100, 200, 500, and 1000 mg/L 1-Octadecene were not completely soluble and solids were observed floating at the surface.
Conclusions	The acute toxicity of C 18 linear alpha olefin (1-Octadecene) to rainbow trout fingerling, *Salmo gairdneri,* was determined in an aqueous toxicity test (daily static renewal) with nominal exposures to 100, 200, 500 and 1000 mg 1-Octadecene/L. No mortality was observed at any concentration tested during the 96 h test duration. Therefore, the 96 h LC50 for *S. gairdneri* fingerlings was greater than the highest concentration tested (1000 mg/L).
Data Quality	Reliability: 3; Not reliable.
References	Pearson N. (1985). C 18 Linear Alpha Olefin (1-Octadecene): Acute Toxicity (*Salmo gairdneri, Daphnid magna* and *Selenastrum capricornutum)* and n-octanol/water coefficient. Shell Research Limited, Sittingbourne Research Center. Shell Report # SBGR.85.059.

CAS No. 112-88-9
TOXICITY TO AQUATIC PLANTS

Test Substance	CAS No. 112-H-9; C 18 linear alpha olefin (1-Octadecene)
Remarks	Source: Shell Chemicals UK Ltd., Stanlow. Stability during use confirmed by infra-red spectra. Density ▪ 0.788 kg/L @ 20°C. Clear, colorless liquid.
Method/guideline	Similar to OECD 202
Test type	4 day growth inhibition test
GLP	yes
Year	1985
Species/strain #/source	*Selenastrum capricornutum*/ATCC 22662/American Type Culture Collection, Maryland, USA.
Element basis	500 cells/mL
Exposure period	72 h
Statistical methods	no specifics
Test Conditions	*S. capricornutum* were obtained from the axenic laboratory culture derived from a strain obtained from the American Type Culture Collection (Maryland, USA). Sixteen Erlenmeyer flasks containing 50 ml of culture medium were prepared. Quantities of 1-Octadecene in Analar Acetone were added to ten vessels to obtain

	nominal concentrations of 1.0, 2.2, 4.6, 10, 22, 46, 100, 220, 460, and 1000 mg 1-Octadecene/L. The remaining six flasks received no 1-Octadecene, however, acetone concentrations in all flasks (including the controls) where adjusted to 0.1 mg/L. Each flask was inoculated with *S. capricornutum* to an initial concentration of 500 cells/ml. Flasks were incubated at 100 cycles/mm under constant illumination (approximately 3000 lux). Tests temperatures ranged from 22-26°C and pH of test solutions ranged from 7.4-7.7 s.u.
Results	No concentrations tested resulted in reductions in cell number at day 4 compared with controls. Therefore, the 96 h EC50 was greater than 1000 mg/L.
Remarks	Concentrations of 10, 22, 46, 100, 220, 460, and 1000 mg/L I-octadence were not completely soluble and were visible at the surface of the test solutions.
Conclusions	The acute toxicity of C 18 Linear Alpha Olefin to the planktonic algae, *Selenastrum capricornutum,* was determined in a 4 day growth test. None of the concentrations of the olefin tested caused a reduction in cell number at day 4 compared to the mean cell number at day 4 in the controls. The 96 h EC50 was therefore greater than 1000 mg/L, the highest concentration tested.
Data Quality	Reliability: 3; Not reliable.
References	Pearson N. (1985). C 18 Linear Alpha Olefin (1 -octadecene): Acute Toxicity (*Salmo gairdneri, Daphnia magna and Selenastrum capricornutum)* and n-octanol/water coefficient. Shell Research Limited, Sittingbourne Research Center. Shell Report # SBGR.85.059.

CAS No. 112-88-9
BIODEGRADATION

Test Substance	CAS No. 112-88-g; C 18 linear alpha olefin (I-Octadecene)
Remarks	Source: Shell Chemicals UK Ltd., Stanlow. Purity - 97.2%. Stability during use confirmed by infra-red spectra. Density - 0.788 kg/L @ 20°C. Clear, colorless liquid.
Method/guideline	EEC Directive 84/449/EEC; Similar to OECD (301 D) Closed Bottle Test.
Test Type	aerobic
GLP	Yes
Year	1985
Contact time	28 days
Innoculum	activated sludge
Test Conditions	Microorganisms were obtained from Sittingbourne Sewage Works (UK) and prepared according to standard test protocols. 1-Octadecene was added to the test medium from a stock solution containing 2.4 g/L emulsified in Dobane PT sulphonate. The final test concentration was 3 mg 1-Octadecene/L. Test bottles were incubated at 21±1°C and the extent of biodegradation was determined by

measuring oxygen concentration in the bottles at days 5, 15 and 28. Controls with no microbial innoculum (control) and with medium plus microbial innoculum only (blank) were included. Sodium benzoate was used as a biodegradable substance to demonstrate the activity of the microbial innoculum.

Results Under these test conditions, 1-Octadecene was oxidized to I O-4 1% of the theoretical oxygen demand by day 5 and 39-48% by day 28. These results indicated that although biodegradation occurred, 1-Octadecene was not considered readily biodegradable.

Conclusions Cl 8 linear alpha olefin was degraded by 39-48% of the theoretical oxygen demand being consumed in 28 days. There was no significant inhibition of microbial activity under the test conditions.

Data Quality Reliability: 2; Reliable with restrictions.

References Cook K. (1985). C 18 Linear Alpha Olefin: An Assessment of Ready Biodegradability. Shell Research Limited, Sittingbourne Research Center. Shell Report # SBGR.85.115.

CAS No. 112-88-9
BIODEGRADATION

Test Substance CAS No. 112-88-9; C 18 linear alpha olefin (1-Octadecene)

Remarks Source: Shell Chemicals UK Ltd., Stanlow. Purity - 97.2%. Stability during use confirmed by infra-red spectra. Density - 0.788 kg/L @ 20°C. Clear, colorless liquid.

Method/guideline EEC Directive 84/449/EEC; Similar to OECD (30 1B) Modified Sturm Test
Test Type aerobic
GLP Yes
Year 1985
Contact time 41 days
Innoculum activated sludge

Test Conditions Microorganisms were obtained from a fresh activated sludge from Canterbury Sewage Works (UK) according to standard test protocols. Test substance added to the test medium from a stock solution containing 2.4 g/L emulsified Dobane PT sulphonate. The final targeted nominal test concentration was 20 mg 1-Octadecene/L. Test medium was dispensed into Sturm vessels, inoculated, then aerated with 60 ml/min of CO_2-free air. Vessels were incubated at 22±1 °C for 41 days. The extent of biodegradation was determined by titrating the total CO_2 released from the incubation on days 5, 7, 13, 16, 23, 28, 36, and 41. The medium was acidified on day 40 to release the total carbon dioxide by day 41. Controls with mineral medium and microbial innoculum (blank) were included.

Results	Data indicated that 77-8 1% of the theoretically possible carbon dioxide evolved in 28 days, and 80-83% evolved by 41 days. Although 1-Octadecene was biodegradable, it is not known whether 60% degradation was reached within 10 days.
Conclusions	In the Modified Sturm Test Cl8 linear alpha olefin was degraded with 77-8 1% of the theoretical amount of carbon dioxide being released in 28 days and 80-83% after 41 days.
Data Quality	Reliability: 2; Reliable with restrictions.
References	Cook K. (1985). C 18 Linear Alpha Olefin: An Assessment of Ready Biodegradability. Shell Research Limited, Sittingboume Research Center. Shell Report # SBGR.85.115.

CAS No. 68526-58-9
Inhalation

Test Substance	Alkenes, Cl 1-13, Cl2 rich
CAS No.	**68526-58-9**
Method/Guideline	**NA**
Type of Study	Inhalation LC_{50}
GLP	Pre-GLP
Year	1961
Species/strain	Swiss Albino Mice, Wistar Rats, English short hair guinea pigs
Sex	Males
No. of animals/sex/dose	1 O/species
Route of admin	Inhalation
Vehicle	NA
Frequency of Treatment	Single Dose
Dose/Concentration Levels	4.4 mg/L for 6 hours (saturated vapors only, no aerosol)
Control group and Treatment	Control animals (5/sex/species) were exposed to clean air at the same flow rate as the treated group.
Remarks on Test Conditions	Air was bubbled through the test material and into a chamber to give a total flow through the chamber of 35 liters/minute. The theoretical mean chamber concentration (4.4 mg/L) was calculated from the loss of material and airflow through the chamber. Animals were observed throughout the exposure period for signs of toxicity. Following the exposure period, animals were observed for signs of toxicity daily for 14 days. Gross necropsies were performed on any animals that died during the study and all animals at the completion of the study.
Results (LD_{50} or LC_{50})	LC_{50} > 4.4 mg/L for 6 hours
Remarks	Immediately following initiation of the exposure, all animals exhibited increased motor activity. Lacrimation was observed in rats and guinea pigs beginning at the 90-minute interval. Otherwise, all animals seemed normal in appearance and behavior throughout the study. No abnormalities were observed at necropsy.
Conclusions	Under conditions of this study, Alkenes, C 1 l-1 3, C 12 rich have a low order of acute inhalation toxicity in rats.
Data Quality	1 ▪ Valid without restrictions

Reference	Hazleton Laboratories, Inc.: Acute Oral Administration - Rats, Acute Dermal Application - Rabbits, Acute Eye Application - Rabbits, Acute Inhalation Exposure - Mice, Rats, Guinea Pigs; Performed for Esso Research and Engineering Co., 196 1.
Date Last changed	October, 2000

CAS No. 68526-58-9
Oral Toxicity

Test Substance	Alkenes, Cl 1-13, Cl2 rich
CAS No.	68526-58-9
Method/Guideline	NA
Type of Study	Oral LD_{50}
GLP	Pre-GLP
Year	1961
Species/strain	Sprague-Dawley Rats
Sex	Male
No. of animals/sex/dose	5/dose
Route of admin	Oral gavage
Vehicle	Corn Oil
Frequency Of Treatment	Single Treatment
Dose/Concentration Levels	Either 0.1, 1 .0, and 10.0% volume/volume in corn oil or undiluted. (Equivalent to 24.5, 77.4, 245, 774, 2446, and 7440 mg/kg)
Control group and Treatment	For comparison, untreated animals were necropsied at the end of the study.
Remarks on Test Conditions	Prior to dosage, food was withheld from the animals for three hours. Following exposure, food and water was available at all times. The animals were observed for gross effects and mortality at 1, 4, and 24 hours and once daily thereafter for 7 days. Gross necropsies were performed at the end of the observation period. Tissue samples from the 2446 and 7440 mg/kg dose levels were collected for further analysis.
Results (LD_{50} or LC_{50})	LD_{50} > 7740 mg/kg
Remarks	No mortalities were observed at any of the doses tested. Animals at all dosage levels exhibited normal appearance and behavior throughout the entire study and

	showed normal body weight gain. There were no pathological findings at necropsy.
Conclusions	Under the conditions of this study, Alkenes, C 11- 13, C 12-rich have a low order of toxicity
Data Quality	1 - Reliable without restrictions, comparable to a guideline study
Reference	Hazleton Laboratories, Inc.: Acute Oral Administration - Rats, Acute Dermal Application - Rabbits, Acute Eye Application - Rabbits, Acute Inhalation Exposure - Mice, Rats, Guinea Pigs; Performed for Esso Research and Engineering Co., 196 1.
Date last changed	October, 2000

CAS No. 68526-58-9
Dermal

Test Substance	Alkenes, Cl l-13, Cl2 rich
CAS No.	68526-58-9
Method/Guideline	NA
Type of Study	Dermal LD_{50}
GLP	Pre-GLP
Year	1961
Species/strain	Albino rabbits
Sex	Males and Females
No. of animals/sex/dose	2/sex/dose
Route of admin	Dermal
Vehicle	NA
Frequency of Treatment	Single 24-hour exposure
Dose/Concentration Levels	77.4, 245, 774, 2446 mg/kg.
Control group and Treatment	NA
Remarks on Test Conditions	Undiluted test material was applied to clipped, intact abdominal skin under rubber dental damming. The trunks of the animals were wrapped securely with adhesive binder to prevent ingestion of the test substance. Following the 24-hour exposure period, the binder was removed and the exposed area was sponged with warm water to remove residue. Animals were observed for gross signs of irritation and systemic toxicity daily for 7 days. Following the post-exposure

observation period, animals were weighed, sacrificed and necropsied. Throughout the study, food and water were available at all times and animals were housed individually. Tissue samples were taken from animals at the 774 and 2446 mg/kg dose levels.

Results (LD_{50} or LC_{50}) LD_{50} > 2446 mg/kg

Remarks No mortalities were observed at any dose tested. One animal in the 245 mgl/kg dose group had diarrhea on the last day of the study and a net loss of weight. The remaining animals exhibited normal appearance and behavior throughout the entire study and showed normal body weight gain. One animal in the 1000 µl/kg and two animals in the 2446 mgl/kg dose groups had parasitic infections in the liver. No other abnormalities were observed at necropsy.

Upon removal of the binders, the exposed skin showed slight erythema. Three of the high dose animals displayed slight edema, which subsided within 48 hours. By 48 hours, low dose animals showed no signs of irritation. Erythema in the high dose animals completely subsided by the third day. By Day 12, all signs of irritation had completely cleared in all of the animals with the exception of slight desquamation in one high dose animal.

Conclusions Alkenes, C 11- 13, C 1 Z-rich have a low order of acute dermal toxicity.

Data Quality 1- Reliable without restrictions

Reference Hazleton Laboratories, Inc.: Acute Oral Administration - Rats, Acute Dermal Application - Rabbits, Acute Eye Application - Rabbits, Acute Inhalation Exposure - Mice, Rats, Guinea Pigs; Performed for Esso Research and Engineering Co., 196 1.

Date last changed October, 2000

CAS No. 68526-52-3
Genetic Toxicity - in Vivo

Test Substance	Alkenes, C6
CAS No.	68526-52-3
Method	EPA OTS 798.5395
Type of Study	Mouse Micronucleus
GLP	Yes
Year	1993
Species/Strain	Mouse/ B6C3F 1
Sex	Male and Female
Number/sex/dose	15/sex
Route of admin	Inhalation
Vehicle	NA
Exposure Period	6 hours/day for 2 consecutive days

Concentrations	Target exposure: 1000 ppm; Actual mean exposure: 1057 ppm (Saturated vapors, no aerosol)
Controls	Positive: Cyclophosphamide (40 mg/kg) in water by oral gavage Negative: Air (Sham exposure)
Statistical Methods	To determine the percentage of micronuclei, 1000 polychromatic erythrocytes from each animal were examined for micronuclei. To determine the percentage of polychromatic erythrocytes, the number of polychromatic erythrocytes in a total of 1000 erythrocytes was determined. Statistical analysis included calculation of means and standard deviations of the micronuclei data and a test of equality of group means by a standard one way analysis of variance at each time period. When the ANOVA was significant, comparisons of carrier control to dosed group means were made according to Duncan's Multiple Range Test. Data from both males and females were analyzed as a single group to facilitate comparisons to published data.
Remarks on Test Conditions	Vapors were generated by forcing the test material with a piston pump through a glass cylinder with heating tape. Vapors were drawn into the chamber with air flow at a rate of 200 liters/minute. Nominal and actual concentrations were determined by net weight loss of the test material and by gas chromatography, respectively. Animals were exposed to vapors of the test substance for 6 hours per day on 2 consecutive days. During each exposure, animals were observed hourly. The positive control, cyclophosphamide, was administered by oral gavage as a single dose. Animals from the treated group were sacrificed by carbon dioxide asphyxiation at appropriately 24 hours after the second day of exposure. Animals treated with cyclophosphamide were sacrificed 24 hours following dose administration. Immediately upon sacrifice, the bone marrow was removed from both femurs of each animal, resuspended, and prepared for microscopy. Samples were blindly coded and stained with acridine orange.
Results	Negative
Remark for Results	The test material was not clastogenic since it did not induce a statistically significant increase in the mean number of micronucleated polychromatic erythrocytes, indicating that the test substance is not clastogenic. In addition, the test substance did not induce a statistically significant decrease in the mean percent of polychromatic erythrocytes, indicating that the test substance did not induce bone marrow toxicity. The positive control did induce a statistically significant increase in the mean number of micronucleated polychromatic erythrocytes and was therefore clastogenic. The sham control values for the mean number of micronucleated polychromatic erythrocytes were within the normal range for the negative control.
Conclusions	Under the conditions of this assay, Alkenes, C6 are not clastogenic following inhalation exposure in mice.
Reference	"In vivo mammalian bone marrow micronucleus assay: inhalation dosing method," Exxon Biomedical Sciences, Inc. 199 1

Date last changed December, 2000

CAS No. 68526-52-3
Genetic Toxicity – in Vivo

Test Substance	Alkenes, C6
CAS No.	68526-52-3
Method	EPA OTS 798.5395
Type of Study	Mouse Micronucleus
GLP	Yes
Year	1991
Species/Strain	Mouse/ B6C3F1
Sex	Male and Female
Number/sex/dose	65/sex
Route of admin	Oral gavage
Vehicle	NA
Exposure Period	Single dose
Concentrations	1.25, 2.5, and 5 g/kg. Concentrations were based on the results of a range-finding study.
Controls	Positive: Cyclophosphamide (40 mg/kg) Negative: Corn oil
Statistical Methods	To deterrnine the percentage of micronuclei, 1000 polychromatic erythrocytes from each animal were examined for micronuclei. To determine the percentage of polychromatic erythrocytes, the number of polychromatic erythrocytes in a total of 1000 erythrocytes was determined. Statistical analysis included calculation of means and standard deviations of the micronuclei data and a test of equality of group means by a standard one way analysis of variance at each time period. When the ANOVA was significant, comparisons of carrier control to dosed group means were made according to Duncan's Multiple Range Test. A standard regression analysis was performed to test for a dose response. Sexes were analyzed separately.
Remarks on Test Conditions	The test material and the carrier were administered by oral gavage as a single dose to mice (not fasted). The positive control, cyclophosphamide, was administered by intraperitoneal injection as a single dose. Animals from the appropriate groups were sacrificed by carbon dioxide asphyxiation at appropriately 24, 48 and 72 hours after dose administration. Animals dosed with cyclophosphamide were sacrificed at 24 hours only. Immediately upon sacrifice, the bone marrow was removed from both femurs of each animal, resuspended, and prepared for microscopy. Samples were blindly coded and stained with acridine orange. GLP Deviations: Analysis of the material stability and purity were the responsibility of the study sponsor, it is not known whether these procedures were performed.
Results	Positive

Remarks for Results	The test material induced a statistically significant increase in the mean number of micronucleated polychromatic erythrocytes per 1000 cells at 5.0 g/kg for the 24-hour males and females (6.8 +/- 3.12 and 5.4 +/- 2.1, respectively). The mean number of micronucleated polychromatic erythrocytes for the positive controls at 24 hours for males and females were 36.2 +/- 10.5 and 30.4 +/- 9.0 and the negative controls were 2.4 +/- 0.9 and 2.6 +/- 1.5. The increase in micronucleated polychromatic erythrocytes observed at 24 hours was dose-related. However, at 48 and 72 hours after the initial exposure, the mean number of micronuclei did not differ between the control and treated groups. The test substance did not induce a statistically significant decrease in the mean percent of polychromatic erythrocytes, indicating that the test substance is not toxic to bone marrow. The positive control induced significant increases in the mean number of micronucleated polychromatic erythrocytes. The positive control also induced a statistically significant decrease in the mean percent of micronucleated polychromatic erythrocytes in male mice. Carrier control values for the mean percent of micronucleated polychromatic erythrocytes and the mean number of micronucleated polychromatic erythrocytes were within the normal range for the negative controls. Alkenes, C6 produced a slight, transient increase in micronucleated polychromatic erythrocytes at the highest level by oral gavage. However, given that inhalation is the primary route of industrial exposure, a micronucleus study was repeated with inhalation as the route of administration. This study produced negative results (IUCLID section 5.6). In addition, Alkenes, C6 are not mutagenic ***in vitro.*** Collectively, these data suggest that Alkenes, C6 are not expected to be genotoxic.
Conclusions	Under the conditions of this study, Alkenes, C6 were clastogenic to the bone marrow of B6C3F1 mice when administered by oral gavage at 5.0 g/kg 24 hours prior to analysis, but not at 48 and 72 hours post-exposure.
Data Quality	1 - Reliable without restrictions
Reference	"In vivo Mammalian Bone Marrow Micronucleus Assay: Oral Gavage Method," Exxon Biomedical Sciences, Inc., 199 1.
Date last changed	December, 2000

CAS No. 68526-52-3
Ames Assay

Test Substance	Alkenes, C6
CAS No.	**68526-52-3**
Method/Guideline	EPA OTS 798.5265
Test Type	Bacterial Mutagenicity - Ames Assay
GLP	**Yes**
Year	1991

Species/strain	Salmonella typhimurium; TA98; TA100; TA1535; TA1537; TA1538
Metabolic Activation	With and without S9 fraction of livers from rats pretreated with Aroclor 1254.
Dose/Cone. Levels	3.2, 10, 32, 100 and 320 µg/plate (Doses were based on a pre-test for toxicity)
Statistical methods	The mean plate count and standard deviation for each dose point were determined. Any test value that was equal to or greater than three times the mean value of the concurrent vehicle control was considered to be a positive dose.
Remarks on Test Conditions	DMSO was used for controls; Ethanol was used for the test material
Solvent	2-Aminoanthracene, 9-Aminoacridine, 2-Nitrofluorene, N-methyl-N-nitro-N-nitrosoguanidine
Positive Controls	Vehicle controls were dosed at 0.1 ml/plate ethanol and 0.1 ml/plate DMSO
Negative Controls	To determine the highest dose of compound to be used in the assay, a dose range from 1 to 10,000 µg/plate was tested. Only strain TA98 was used. The toxicity pretest was repeated and toxicity was observed as a reduction in both background and revertant colony counts. 320 µg/plate was selected as the high dose to be used on the mutagenesis assay for both the saline (-S9) and the +S9 treated plates. A repeat assay was performed in order to verify the data produced in the initial assay.
Results	Negative
Remarks	The test material did not induce a dose related increase in the mutation frequencies of any of the tester strains either in the presence or absence of metabolic activation. All positive and negative controls responded in a manner consistent with data from previous assays.
Conclusions	Under the conditions of this study the test material is not mutagenic for the Salmonella tester strains at doses up to and including 320 µg/plate.
Data Quality	1 - Valid without restrictions
References	Microbial Mutagenesis in *Salmonella:* Mammalian Microsome Plate Incorporation Assay; EBSI, 199 1.
Date Last Changed	December, 2000

CAS No. 68526-53-4
Inhalation

Test Substance	Alkenes, C6-8, C7 rich

CAS No.	68526-53-4
Method/Guideline	NA
Type of Study	Inhalation LC_{50}
GLP	Pre-GLP
Year	1979
Species/strain	Swiss albino Mice, Sprague-Dawley Rats, Hartley Guinea Pigs
Sex	Males and Females
No. of Animals/sex/dose	S/sex/species
Route of admin	Inhalation
Vehicle	NA
Frequency of Treatment	Single Dose
Dose/Concentration Levels	42.3 mg/L for 6 hours; vapors only
Control group and Treatment	Control animals (5/sex/species) were exposed to clean air as a sham exposure.
Remarks on Test Conditions	Room air, at a flow rate of 134 l/minute was bubbled through test material in a flask to produce a vapor-laden airstream that was directed, undiluted, into the exposure chamber. The nominal exposure concentration was calculated by dividing the mass of test material consumed by the total volume of air passing through the chamber. Animals were observed throughout the exposure period for signs of toxicity. Following the exposure period, animals were observed for signs of toxicity daily for 14 days. Body weights were recorded on Days 0, 1, 2, 4, 7, and 14. Gross necropsies were performed on any animals that died during the study and all animals at the completion of the study. During the necropsies, the lungs with trachea, kidneys, and liver were preserved for possible histopathological examination.
Results (LD_{50} or LC_{50})	LC_{50} > 42.3 mg/L for 6 hours
Remarks	In mice, exposure to 42.3 mg/L of the test substance resulted in 1 death 1 hour into the exposure period. All other mice survived until the end of the study. None of the rats died during the study. Two guinea pigs died by 45 minutes into the exposure period. The remaining guinea pigs survived until the end of the study. All exposed species exhibited signs of systemic toxicity including labored breathing, prostration, body tremors, and ataxia during the exposure. However, in the surviving animals, these signs completely reversed within 24 hours following the exposure. Liver discoloration was noted upon necropsy in the mouse and the two guinea pigs that died during the exposure. Otherwise, no significant findings were observed at necropsy.

Conclusions	Under conditions of this study, Alkenes, C6-8, C7 rich have a low order of acute inhalation toxicity in rodents.
Data Quality	1 - Valid without restrictions
References	"An Acute Inhalation Toxicity Study of MRD-ECH-78-32 in the Mouse, Rat, and Guinea Pig," Bio/dynamics, Inc. for Exxon Research and Engineering Company, May 2.5, 1979.
Date Last Changed	October, 2000

CAS No. 68526-53-4
Dermal

Test Substance	Alkenes, C6-8, C7 rich
CAS No.	68526-53-4
Method/Guideline	NA
Type of Study	Dermal LD_{50}
GLP	Pre-GLP
Year	1978
Species/strain	Albino rabbits
Sex	Males and Females
No. of Animals/sex/dose	2/sex/dose
Route of admin	Dermal
Vehicle	NA
Frequency of Treatment	Single 24-hour exposure
Dose/Concentration Levels	200 and 3 160 mg/kg.
Control group and Treatment	NA
Remarks on Test Conditions	Undiluted test material was applied to clipped, abraded abdominal skin under gauze and thick plastic. Following the 24-hour exposure period, the wrapping was removed and the exposed area was wiped to remove residue. Animals were observed for gross signs of irritation and systemic toxicity 1,2,3, and 4 hours post dose and daily for 7 days. Following the post-exposure observation period, animals were weighed, sacrificed and necropsied. Throughout the study, food and water were available at all times and animals were housed individually.

Results (LD_{50} or LC_{50})	LD_{50} > 3 160 mg/kg
Remarks	No mortalities were observed at any dose tested. Lethargy and ataxia were observed in all animals, but these symptoms cleared by Day 2. Dermal reactions were generally moderate at 200 mg/kg and cleared by Day 14. In the high dose group, more severe dermal reactions, including moderate edema and severe erythema, persisted through the study. No significant fluctuations in body weight occurred. Necropsy findings were unremarkable except for a pus-filled liver in 1 rabbit from the high dose group.
Conclusions	Alkenes, C6-8, C7 rich have a low order of acute dermal toxicity.
Data Quality	1 - Reliable without restrictions
References	MB Research Laboratories, Inc., Acute Dermal Toxicity in Albino Rabbits, 1978.
Date Last Changed	October, 2000

CAS No. 68526-53-4
Oral

Test Substance	Alkenes, C6-8, C7 rich
CAS No.	68526-53-4
Method	EPA OTS 798.5395
Type of Study	Mouse Micronucleus
GLP	Yes
Year	1993
Species/Strain	Mouse/ B6C3F 1
Sex	Males and Females
Number/sex/dose	65/sex
Route of admin	Oral gavage
Vehicle	NA
Exposure Period	Single dose
Concentrations	1.25, 2.5, and 5 g/kg. Concentrations were based on the results of a range-finding study.
Controls	Positive: Cyclophosphamide (40 mg/kg) Negative: Corn oil
Statistical Method	Analysis of variance (ANOVA), Duncan's Multiple Range Test
Remarks on Test Conditions	The test material and the carrier were administered by oral gavage as a single dose to mice (not fasted). The positive control, cyclophosphamide, was administered by intraperitoneal injection as a single dose. Animals from the appropriate groups were sacrificed by carbon dioxide asphyxiation at appropriately 24, 48 and 72 hours after dose administration. Animals dosed with cyclophosphamide were sacrificed at 24 hours only. Immediately upon sacrifice,

	the bone marrow was removed from both femurs of each animal, resuspended, and prepared for microscopy. Samples were blindly coded and stained with acridine orange.
Results	Negative
Remarks for Results	There was no statistically significant increase in the mean number of micronucleated polychromatic erythrocytes, indicating that the test material was not clastogenic. The positive control induced a statistically significant increase in the mean number of micronucleated polychromatic erythrocy-tes, which indicates that the positive control is clastogenic. The test material did not induce a statistically significant increase in the mean number of micronucleated polychromatic erythrocytes. In addition, the test material did not induce a significant decrease in the mean percent of polychromatic erythrocytes, which is a measure of bone marrow toxicity.
Conclusions	Under the conditions of this study, the test sample is not considered to be mutagenic at doses up to and including 5.0 g/kg.
Data Quality	1 - Reliable without restrictions
References	Exxon Chemical Company (1993). In Vivo Mammalian Bone Marrow Micronucleus Assay: Oral Gavage Dosing Method. Unpublished Report.
Date Last Changed	October, 2000

CAS No. 68526-54-5
Inhalation

Test Substance	Alkenes, C7-9, C8 rich
CAS No.	**68526-54-5**
Method/Guideline	NA
Type of Study	Inhalation LC_{50}
GLP	Pre-GLP
Year	1977
Species/strain	Albino rats, mice, and guinea pigs
Sex	Males
No. of animals/sex/dose	I O/species
Route of admin	Inhalation
Vehicle	NA
Frequency of Treatment	Single 6-hour Exposure
Dose/Concentration Levels	**3** 1.67 mg/L

Control group and Treatment	Control animals were exposed to clean air at the same flow rate as the treated group.
Remarks on Test Conditions	Rats, mice, and guinea pigs received a single, 6-hour exposure to the test material. The exposure was conducted in a 100-liter glass and stainless steel chamber. The compound was placed in a 2000 ml three-necked flask, pre-weighed and mounted outside the chamber. Air was bubbled through the test material at 5 L/min and was then combined with an additional airflow of 10 L/mm to produce a total flow rate through the chamber of 15 L/min. All animals were observed for signs of toxicity, abnormal behavior, and mortality during the exposure period and for 14 days after the exposure. Necropsies were performed on all surviving animals and any animals that died during the exposure or post-exposure observation period.
Results (LD_{50} or LC_{50})	LC_{50} > 3 1.7 mg/L (rat) LC_{50} > 3 1.7 mg/L (mouse) LC_{50} < 3 1.7 mg/L (guinea pig)
Remarks	There were no deaths in the air-exposed animals. In the treated animals, six guinea pigs and three rats died during the exposure period. No mice died during the study. One guinea pig died on Day 1 of the recovery period. All animals showed compound awareness 1 minute after exposure began and became increasingly agitated during the first 35 minutes of exposure. After 100 minutes, some animals were experiencing tremors and convulsions. Necropsy examination indicated dark red coloration of the lungs of 15 animals (3 rats, 4 mice, and 8 guinea pigs). Six guinea pigs had liver discolorations. Five guinea pigs showed pale kidney color also. One guinea pig that died showed a large amount of blood in the heart. Fifteen animals (7 rats, 6 mice, and 2 guinea pigs) showed no gross lesions.
Conclusions	Under conditions of this study, Alkenes, C7-9, C8 rich have a low order of acute inhalation toxicity in rats.
Data Quality	1 - Valid without restrictions; Comparable to a guideline study
References	Exxon Corporation (1977). Acute Inhalation Toxicity- Rats, mice and guinea pigs. Unpublished Report.
Date Last Changed	October, 2000

CAS No. 68526-54-5
Oral

Test Substance	Alkenes, C7-9, C8 rich
CAS No.	68526-54-5

Method/Guideline	NA
Type of Study	Oral LD_{50}
GLP	Pre-GLP
Year	1975
Species/strain	Albino Rats
Sex	Male
No. of animals/sex/dose'	10 rats
Route of admin	Oral gavage
Vehicle	NA
Frequency of Treatment	Single Treatment
Dose/Concentration Levels	5000 mg/kg
Control group and Treatment	NA
Remarks on Test Conditions	A single dose of undiluted test material (5,000 mg/kg) was administered to male rats (not fasted). Individual body weights were recorded on Day 0 and Day 7. Gross necropsy examinations were performed on all animals that died or were killed.
Results (LD_{50} or LC_{50})	LD_{50} > 5000 mgikg
Remarks	Hypoactivity and diarrhea were noted within 6-22 hours post-oral administration and subsided by the second post-oral exposure day. There were no significant findings observed during the gross necropsy examination.
Conclusions	Under the conditions of this study, Alkenes, C7-9, C8 rich have a low order of acute oral toxicity.
Data Quality	1 - Reliable without restrictions, comparable to a guideline study
References	Exxon Research and Engineering Company (1975). Chemical Hazard Data Sheet on Octenes and Acute Oral Toxicity Study, Acute Dermal Toxicity Study, Eye Irritation Toxicity Test and Acute Vapor Inhalation Toxicity Study. Unpublished Report.
Date Last Changed	October, 2000

CAS No. 68526-54-5
Dermal

Test Substance	Alkenes, C7-9, C8 rich
CAS No.	68526-54-5
Method/Guideline	NA
Type of Study	Dermal LD_{50}
GLP	Pre-GLP
Year	1975
Species/strain	Albino rabbits
Sex	Males and Females
No. of animals/sex/dose	2/sex/dose
Route of admin	Dermal
Vehicle	NA
Frequency of Treatment	Single 24-hour exposure
Dose/Concentration Levels	200, 3 160 mg/kg.
Control group and Treatment	NA
Remarks on Test Conditions	A single dermal application of the test material was made to four groups of four rabbits at doses of 200 and 3,160 mg/kg. The test material was applied to abraded skin. Individual body weights were recorded on Days 0, 7 and 14. Gross necropsies were performed at the end of the experiment.
Results (LD_{50} or LC_{50})	LD_{50} > 3,160 mg/kg
Remarks	There were no moralities at any dosage level tested. Thus, the LD_{50} in albino rabbits is greater than the highest dose tested. Signs of erythema, mild to moderate edema and second degree bums were observed at 24 hours at both doses. At 7 and 14 days, focal escharosis was observed at the low dose. At the high dose, escharosis, fissuring, hemorrhaging, and wrinkling were observed at 7 days and escharosis was observed at 14 days. Necropsy examination revealed emaciation and depletion of fat stores in one male rabbit in the low dose group. No other gross pathologic alterations were observed.
Conclusions	Alkenes, C8- 10, C9 rich have a low order of acute dermal toxicity.
Data Quality	1 - Reliable without restrictions

References	Exxon Research and Engineering Company (1975). Chemical Hazard Data Sheet on Octenes and Acute Oral Toxicity Study, Acute Dermal Toxicity Study, Eye Irritation Toxicity Test and Acute Vapor Inhalation Toxicity Study. Unpublished Report.
Date Last Changed	October, 2000

CAS No. 68526-55-6
Inhalation

Test Substance	Alkenes, C8-10, C9 rich
CAS No.	68526-55-6
Method/Guideline	NA
Type of Study	Inhalation LC_{50}
GLP	Pre-GLP
Year	1977
Species/strain	CD- 1 Mice, Sprague-Dawley Rats, Hartley Guinea Pigs
Sex	Males and Females
No. of animals/sex/dose	S/sex/species
Route of admin	Inhalation
Vehicle	NA
Frequency of Treatment	Single Dose
Dose/Concentration Levels	11.1 mg/L for 6 hours
Control group and Treatment	Control animals (5/sex/species) were exposed to clean air at the same flow rate as the treated group.
Remarks on Test Conditions	An airstream was bubbled through the test material at a rate of 33.1 L/min and passed through a 760 L test chamber containing the test animals for a total of 6 hours. Animals were observed throughout the exposure period for signs of toxicity. Following the exposure period, animals were observed for signs of toxicity daily for 14 days. Body weights were recorded on Days 0, 1, 2, 4, 7, and 14. Gross necropsies were performed on any animals that died during the study and all animals at the completion of the study.
Results (LD_{50} or LC_{50})	LC_{50} > 11.1 mg/L for 6 hours

Remarks	None of the animals died during the exposure period or during the 14-day post-exposure observation period. A total of 132.1 g of test material was delivered to the chamber during the course of the exposure. The overall nominal concentration of the test substance was 11.1 mg/L.. During the last 4 hours of exposure, mice exhibited labored breathing patterns, rats exhibited limb ataxia and generally lethargic behavior, and the guinea pigs showed slight tremors. No similar signs were noted in the control animals, indicating that these effects were due to exposure to the test substance. However, all of the symptoms subsided as the test chamber was cleared with clean air. On day 4 of the post-exposure observation period, one of the exposed mice had tremors, but the symptoms only occurred on that day and were not believed to be due to exposure to the test substance. Signs of toxicity observed during the 14-day post-exposure period included dry rales, soft stool, and nasal discharge in rats, however, these signs were observed in both the exposed and control animals and are not believed to be due to the test substance. In both exposed animals and controls, there was a slight decrease in body weight during the first few days following exposure, after which the animals recovered their normal body weight. There were no significant differences observed between the exposed animals and the test animals at necropsy. Although there was a high incidence of kidney lesions in both groups of guinea pigs, the rate was slightly higher in the exposed animals than in the controls. However, the difference was not statistically significant.
Conclusions	Under conditions of this study, Alkenes, C8-10, C9 rich have a low order of acute inhalation toxicity in rats.
Data Quality	1 - Valid without restrictions
References	"An Acute Inhalation Toxicity Study of MRD-76-57 in the Mouse, Rat, and Guinea Pig," Bio/dynamics, Inc. for Exxon Research and Engineering Company, April 11, 1977.
Date Last Changed	October, 2000

CAS No. 68526-55-6
Oral

Test Substance	Alkenes, C8-10, C9 rich
CAS No.	**68526-55-6**
Method/Guideline	NA
Type of Study	Oral LD_{50}
GLP	Pre-GLP
Year	1957
Species/strain	Holtzman Rats
Sex	Male
No. of animals/sex/dose	5/dose
Route of admin	Oral gavage

Vehicle	0.5% aqueous methyl cellulose solution
Frequency of Treatment	Single Treatment
Dose/Concentration Levels	0.1, 1 .0, and 10.0% volume/volume in a 0.5% aqueous methyl cellulose solution. (Equivalent to 7.4, 23.3, 73.8, 233, 738, 2332 mgikg)
Control group and Treatment	For comparison, untreated animals were necropsied at the end of the study.
Remarks on Test Conditions	Prior to dosage, food was withheld from the animals for three hours. Following exposure, food and water were available at all times. The animals were observed for gross effects and mortality several times on the day of exposure and once daily thereafter for 7 days. Gross necropsies were performed at the end of the observation period.
Results (LD_{50} or LC_{50})	LD_{50} > 2332 mg/kg
Remarks	No mortalities were observed at any of the doses tested. Animals in the high dose group appeared slightly depressed the day after administration of the test material. For several hours following exposure, the animals in the high dose group also showed slight nasal discharge. Otherwise, all animals appeared normal throughout the study. Animals in all groups exhibited normal weight gain. Gross necropsy did not reveal any abnormalities other than slightly congested adrenal glands in animals from the three higher dose levels (233, 738, and 2332 mgl/kg).
Conclusions	Under the conditions of this study, Alkenes, C8-10, C9 rich have a low order of toxicity.
Data Quality	1 - Reliable without restrictions, comparable to a guideline study
References	Hazleton Laboratories for Esso Research and Engineering Co., Acute Oral Administration, 1957.
Date Last Changed	October, 2000

CAS No. 68526-55-6
Dermal

Test Substance	Alkenes, C8-10, C9 rich
CAS No.	**68526-55-6**
Method/Guideline	NA
Type of Study	Dermal LD_{50}

GLP	Pre-GLP
Year	1957
Species/strain	Albino rabbits
Sex	Males
No. of animals/sex/dose	4/dose
Route of admin	Dennal
Vehicle	NA
Frequency of Treatment	Single 24-hour exposure
Dose/Concentration Levels	73.8, 233, 738, 2332 mg/kg.
Control group and Treatment	NA
Remarks on Test Conditions	Undiluted test material was applied to clipped, intact abdominal skin under rubber dental damming. The trunks of the animals were wrapped securely with adhesive binder to prevent ingestion of the test substance. Following the 24-hour exposure period, the binder was removed and the exposed area was sponged with warm water to remove residue. Animals were observed for gross signs of irritation and systemic toxicity daily for 7 days. Following the post-exposure observation period, animals were weighed, sacrificed and necropsied. Throughout the study, food and water were available at all times and animals were housed individually.
Results (LD_{50} or LC_{50})	LD_{50} > 2332 mg/kg
Remarks	No mortalities were observed at any dose tested. The abdomens and binders were dry at the end of the exposure period, indicating a good rate of dermal absorption of the applied material. The test material produced mild dermal irritation characterized by mild erythema. Most of the animals showed slight atonia for several days of the observation period and desquamation during the final two days of the observation period. Throughout the study, all animals exhibited normal appearance and behavior. Body weight gain was normal throughout the study. There were no significant findings at necropsy.
Conclusions	Alkenes, C8- 10, C9 rich have a low order of acute dermal toxicity.
Data Quality	1 - Reliable without.restrictions
References	Hazleton Laboratories for Esso Research and Engineering Co., Acute Dermal Application, 1957.
Date Last Changed	October, 2000

CAS No. 68526-55-6
Oral

Test Substance	Alkenes, C8-10, C9 rich
CAS No.	68526-55-6
M e t h o d	EPA OTS 798.5395
Type of Study	Mouse Micronucleus
Test system	
GLP	Yes
Year	1991
Species/Strain	Mouse/ B6C3F 1
Sex	Male and Female
Number/sex/dose	65/sex
Route of admin	Oral gavage
Vehicle	NA
Exposure Period	Single dose
Concentrations	1.25, 2.5, and 5 g/kg. Concentrations were based on the results of a range-finding study.
Controls	Positive: Cyclophosphamide (40 mg/kg) Negative: Corn oil
Statistical Method	Analysis of variance (ANOVA), Duncan's Multiple Range Test
Remarks on Test Conditions	The test material and the carrier were administered by oral gavage as a single dose to mice (not fasted). The positive control, cyclophosphamide, was administered by intraperitoneal injection as a single dose. Animals from the appropriate groups were sacrificed by carbon dioxide asphyxiation at appropriately 24, 48 and 72 hours after dose administration. Animals dosed with cyclophosphamide were sacrificed at 24 hours only. Immediately upon sacrifice, the bone marrow was removed from both femurs of each animal, resuspended, and prepared for microscopy. Samples were blindly coded and stained with acridine orange. GLP Deviations: Analysis of the material stability and concentration verification were not performed.
Results	Negative
Remarks for Results	There was no statistically significant increase in the mean number of micronucleated polychromatic erythrocytes. Thus, the test material was not clastogenic. The positive control induced a statistically significant increase in the mean number of micronucleated polychromatic erythrocytes, which indicates that the positive control is clastogenic. The test material did not induce a statistically significant increase in the mean number of micronucleated polychromatic erythrocytes. However, the test material did induce a significant decrease in polychromatic erythrocytes in both males and females at 48 and 72 hours when treated with the high dose. In addition, there was a statistically significant

	difference in the mean percent of polychromatic erythrocytes in the high dose group at 48 and 72 hours and in the mid dose group at 48 hours. These observations indicate that the test material was toxic to mouse bone marrow at higher concentrations, but did not induce micronuclei formation,
Conclusions	Under conditions of this assay, the test material is not considered clastogenic in mice up to and including 5.0 g/kg when evaluated up to 72 hours after dose administration.
Data Quality	1 - Reliable without restrictions
References	"In vivo mammalian bone marrow micronucleus assay: oral gavage method," Exxon Biomedical Sciences, Inc. 199 1.
Date Last Changed	October, 2000

CAS No. 68526-55-6
Ames Assay

Test Substance	Alkenes, C8-10, C9 rich
CAS No.	68526-55-6
Method/Guideline	EPA OTS 798.5265
Test Type	Ames Assay
GLP	Yes
Year	1991
Species/strain	Salmonella typhimurium; TA98; TA100; TA1535; TA1537; TA1538
Metabolic Activation	With and without S9 fraction of livers from rats pretreated with Aroclor 1254.
Dose/Cow. Levels	10, 32, 100, 320, and 1000 µg/plate
Statistical methods	The mean plate count and standard deviation for each dose point were determined. Any test value that was equal to or greater than three times the mean value of the concurrent vehicle control was considered to be a positive dose.
Remarks on Test Conditions	DMSO was used for controls; Ethanol was used for the test material
Solvent	2-Aminoanthracene, 9-Aminoacridine, 2-Nitrofluorene, N-methyl-N-nitro-N-nitrosoguanidine
Positive Controls	Vehicle controls were dosed at 0.1 ml/plate ethanol and 0.1 ml/plate DMSO
Negative Controls	To determine the highest dose of compound to be used in the assay, a dose range from 1 to 10,000 µg/plate was tested. Only strain TA98 was used. The toxicity pretest was repeated and toxicity was observed as a reduction in both background and revertant colony counts. 1000 µg/plate was selected as the high dose to be

	used on the mutagenesis assay for both the saline (-S9) and the +S9 treated plates. A repeat assay was performed in order to verify the data produced in the initial assay.
Results	Negative
Remarks	The test material did not produce any evidence of mutagenicity. Doses were considered positive if test values were equal to or greater than 3X the mean value of the vehicle control. In the initial and repeat assays, neither a positive response nor a dose related increase in revertants was observed for any of the tester strains either in the presence or absence of metabolic activation. All other positive and negative controls responded in a manner consistent with data from previous assays.
Conclusions	Under conditions of this assay, the test material was not mutagenic for the *Salmonella* tester strains at doses up to and including 1000 µg/plate.
Data Quality	1 - Valid without restrictions
Reference	Microbial Mutagenesis in *Salmonella:* Mammalian Microsome Plate Incorporation Assay; EBSI, 199 1.
Date last changed	November, 2000

Existing Chemical ID: 629-73-2
EINECS Name: hexadec-1-ene
EINECS No. 211-105-S
Biodegradation

Type	aerobic
Inoculum	other: Mixture from several sources in Japan that included 4 sewage plants, 3 rivers, 2 bays, and 1 lake.
Concentration	100mg/l related to Test substance related to
Contact time	28 day
Degradation	- % after
Result	readily biodegradable
Deg. Product	
Method	OECD Guide-line 30 1 C "Ready Biodegradability: Modified MITI Test (I)"
Year	
GLP	no data
Test substance	other TS: 1 -Hexadecene
Result	55 - 77% after 28 days.

Test condition

A mixed inoculum was developed and maintained that used ten sources and included: return sludge from 1 industrial and 3 city sewage plants; and water from 3 rivers, 2 bays, and 1 lake, with soil from land adjacent to these bodies of water. A filtrate from the combination of these samples was prepared and added to an existing culture that had been developed from the same sources as above and maintained under aeration and with a synthetic feed composed of glucose, peptone, and monopotassium phosphate. The inoculum used for this biodegradation test was removed from the mixed culture and added to the test systems at a concentration of 30 mg of inoculum per liter of test medium.

Blank and positive controls were used per guideline. The positive control, aniline, was added to the control vessel at a loading rate of 100 mg/L.

Test systems contained 100 mg test substance per liter of medium.

Temperature of incubation: 24 - 26°C

Oxygen consumption was monitored using a closed system oxygen consumption measuring apparatus from Ohkura Electric Co., Ltd.

Percent biodegradation was calculated as a percent ratio of the biological oxygen demand (BOD) in the test system less the BOD of the blank control, to the calculated theoretical oxygen demand of the added test material.

When percentage biodegradations of aniline calculated by BOD value were beyond 40% and 60% at the 7th and 14th day, respectively, it was concluded that the test condition was valid.

Reliability	(2) valid with restrictions
	This study is considered valid with restrictions. Reference compound data are not presented and the range in biodegradation values is not less than 20% as required in OECD guideline 30 1 C.
13.02.2001	Chemicals Inspection and Testing Institute, Japan. 1992. Biodegradation and Bioaccumulation Data of Existing Chemicals Based on the CSCL Japan. Japan Chemical Industry Ecology-Toxicology and Information Center.

Existing Chemical ID: 629-73-2
EINECS Name: hexadec-1-ene
EINECS No. 211-105-8
Fish Acute

Type	semistatic
Species	Oncorhynchus mykiss (Fish, fresh water)
Exposure period	96 hour(s)
Unit	mg/l
Analytical Monitoring	yes
NOEC	>= 1000 -
LC50	> 1000 –
Method	OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year	1993
GLP	yes
Test substance	other TS: Gulftene 16 (Hexadecene-1)
Result	There were no mortalities or sub-lethal effects. The 96-hour LC50 was >1000 mg/L loading rate Water Accommodated Fraction (WAF). The NOEC was >= 1000 mg/L loading rate WAF.
Test condition	A study was performed to assess the acute toxicity of Gulftene 16 to rainbow trout (Oncorhynchus mykiss) under semistatic conditions (daily renewal).
	The water accommodated fraction (WAF) was prepared by mixing 1000 mg/l Gulftene 16 with water. The mixture was stirred on magnetic stirrers for 24 hours at 14°C and then allowed to settle for approximately 1 hour. The WAF was then withdrawn via a siphon prior to dilution to the required exposure levels and testing.
	Water samples were taken from the control and each exposure level at 0 hours for test concentration verification. The concentrations were analyzed using an Ionics TC/TOC Analyser Model 5 55. Since the values obtained at 0 hours demonstrated that Total Carbon (dissolved) values for the exposure media were no higher than the control level, analysis was not carried out at other time points.

	Groups of ten juvenile fish (5 test concentrations plus one control) were exposed for 96 hours to dilution series of a single WAF of Gulftene 16 (100 % WAF equivalent to 1000 mg/L). Supplementary aeration was provided. The test concentrations were 10, 18, 32, 56, and 100% WAF. Observations were made on the numbers of dead fish and the incidence of sub-lethal effects after 3, 6, 24, 72 and 96 hours exposure.
Conclusion	There were no mortalities or sub-lethal effects. The 96-hour LC50 was > 1000 mg/L loading rate WAF. The NOEC was >= 1000 mg/L loading rate WAF.
Reliability	(1) valid without restriction
Flag	confidential
13.02.2001	Huntingdon Research Centre, 1993. Gulftene 16 (water accommodated fraction) acute toxicity to rainbow trout. Conducted for Chevron Research and Technology Company, unpublished report.

Existing Chemical ID: 629-73-2
EINECS Name: hexadec-1-ene
EINECS No. 211-105-S

Algae

Species	Selenastrum capricornutum (Algae)
Endpoint	growth rate
Exposure period	72 hour(s)
Unit	mg/l
Analytical Monitoring	yes
NOEC	>= 1000 -
EC50	> 1000 -
Method	OECD Guide-line 20 1 "Algae, Growth Inhibition Test"
Year	1993
GLP	yes
Test substance	other TS: Gulftene 16 (Hexadecene-1)
Result	The mean cell density of the control at 0 hours was 8.25 x 10[4] cells/ml and at 72 hours was 2.78 x 10[6] cells/ml. All test and control cultures were inspected microscopically at 72 hours. There were no abnormalities detected. The 72-hour EbC50 was >1000 mg/L loading rate WAF. The 24-48-hour ErC50 was >1000 mg/L loading rate WAF. The NOEC was >=1000 mg/L loading rate WAF.
Test condition	The water accommodated fraction (WAF) was prepared by mixing 1000 mg/l Gulftene 16 with water. The mixture was stirred on a magnetic stirrer for 24 hours at 24°C and then allowed to settle for approximately 1 hour. The WAF was then withdrawn via a siphon and 100ml was measured into 250ml conical flasks. Flasks were prepared and 2ml of a concentrated algal suspension of Selenastrum capricomutum, (0.870 absorbance @ 665 nm) were added to each flask in order to produce the correct starting cell density. Algal cultures were

exposed to 6 replicates of a single WAF of Gulftene 16 (100% WAF equivalent to 1000 mg/L). The exposed cultures plus one control (6 replicates) were incubated without media renewal on an orbital shaker under continuous illumination at 24°C for 72 hours. Growth was monitored daily by measuring the absorbance of each culture. The cell densities at initiation and termination for the control were determined by direct counting with a haemocytometer.

Water samples were taken from the control and each exposure level at 0 hours for test concentration verification. The concentrations were analyzed using an Ionics TC/TOC Analyser Model 55.5. Since the values obtained at 0 hours demonstrated that Total Carbon (dissolved) values for the exposure media were no higher than the control level, analysis was not carried out at other time points.

Conclusion The 72-hour EbC50 was >1000 mg/L loading rate WAF. The 24-48-hour ErC50 was > 1000 mg/L loading rate WAF. The NOEC was >=1000 mg/L loading rate WAF.

Reliability (1) valid without restriction

Flag confidential

13.02.2001 Huntingdon Research Centre, 1993. Gulftene 16 (water accommodated fraction) algal Growth Inhibition. Conducted for Chevron Research and Technology Company, unpublished report.

Existing Chemical ID: 629-73-2
EINECS Name: hexadec-1-ene
EINECS No. 211-105-8
Oral

Type	other: Acute Peroral/LD50 Toxictiy Test
Species	rat
Strain	Sprague-Dawley
Sex	male/female
Number of Animals	20
Vehicle	other: none
Value	> 10000 - mg/kg bw
Method	OECD Guide-line 40 1 "Acute Oral Toxicity"
Year	1992
GLP	yes
Test substance	other TS: Gulftene 16 (Hexadecene- 1)

Result No deaths were observed at 5.0 g/kg. At 10.0 g/kg, 2 of 5 males and 2 of 5 females died. The acute oral LD50 was greater than 10 g/kg

Significant signs of toxicity included irritation and alopecia of extremities and abdominal area, aggressive behavior (probably attributable to the local irritation),

abnormal gait/hindlimb motion (probably resulting from the irritation), sluggishness, emaciation and excess discharge from the perineal area. Several animals exhibited weight depression (or loss) through 7 days or more. Necropsy (rats that died) revealed discoloration of several lungs, intestines, liver (of 1) and kidneys. Survivors had no remarkable gross lesions. Microscopic evaluation of brains, spinal cords, sciatic nerves and pituitaries revealed no lesions. A detailed neurotoxicological examination, showed numerous gait, postural and behavioral effects. These effects were reversible and considered to be secondary to the irritation caused by the excreted test substance

Based on these results, Gulftene 16 did not appear to produce a primary neurotoxicant effect.

Test condition The purpose of this peroral toxicity test was to assess the potential for neurotoxicity. The test material was administered as single gavage doses **(5.0** g/kg) or divided gavage doses (10.0 g/kg) for which 2 equal portions were given approximately 1 hour apart to groups of 5 female and 5 male fasted Sprague-Dawley rats. Following dosing, the animals were observed for 14 days. When clinical signs indicated neurotoxicity, a battery of functional tests were conducted on Days 1, 2, and 14, and additionally when thought necessary by the neurotoxicologist. Body weights were recorded on Days 0, 7, 14 and at termination. All animals were necropsied after death or sacrifice.

Conclusion In this study, the acute oral LD50 of Gulftene 16 (Hexadecene-1) was greater than 10000 mg/kg. Based on the results of this study, Gulftene 16 did not appear to produce a primary neurotoxicant effect.

Reliability (1) valid without restriction

Flag confidential

13.02.2001 Bushy Run Research Center, 1992. Acute peroral toxicity testing in the rat. Conducted for Chevron Research and Technology Company, unpublished report.

Existing Chemical ID: 629-73-2
EINECS Name: hexadec-1-ene
EINECS No. 211-105-8
Inhalation

Type	LC50
Species	rat
Strain	Wistar
Sex	male
Number of Animals	
Vehicle	
Exposure time	1 hour(s)

Value	> 8500 - mg/m³
Method	
Year	1967
GLP	no
Test substance	other TS: 1 -Hexadecene (C 16)
Result	The aerosol generator produced particles that were <8 microns in diameter. Rats showed a drowsey appearance on removal from the chamber. There was no mortality and no significant weight change or gross pathological change on autopsy. Estimated exposure concentrations were 8500 mg/m3 for particles <8u and 150 mg/m3 for particles 0.45 - 2.0u. The LC50 was > 8500 mg/m3.
Test substance	Groups of male albino Wistar rats were exposed for 1 hour to saturated mists of the test substance and observed for 14 days. The animals were observed for toxic signs during exposure and were periodically weighed for 14 days after exposure. On the 14th day, they were sacrificed for the determination of gross pathological changes. The saturated mists were prepared by placing a Dautrabanda nebulizer within the exposure chamber and passing an air line and olefin feed line to it from outside. This aerosol generator produces particles no larger than 8 u in diameter. It was found experimentally that the maximum mist concentration was achieved when the nebulizer was operating at an air flow of 2 l/min with about 50 ml of olefm in the reservoir. Estimates of mist concentration were made from measurement of the volume loss from the nebulizer reservoir and total air flow through the system. Additionally, a sample holder containing a millipore filter was positioned downward in the chamber and air drawn through at a rate calculated to collect suspended particles of 2 u or less. The lower size limit of collection by the filter was expected to be 0.45 u. Papers were weighed before and after collection and the weight gain used to calculate concentration of particles in the O-.45-2.0 u range.
Conclusion	The LC50 was > 8500 mg/m3.
Reliability	(2) valid with restrictions No information is given on the number of animals dosed and there are limited details of procedures.
Flag	confidential
21.02.2001	Department of Occupational Health, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania (1967). Toxicological studies on several alpha olefins. Conducted for Gulf Research and Development Company, unpublished report.

CAS No. 131459-42-2
Oral

Type	LD50
Species	rat
Strain	Fischer 344
Sex	male/female
Number of Animals	15
Vehicle	other: none
Value	> 2000 - mg/kg bw
Method	other
Year	1982
GLP	yes
Test substance	other TS: Alkene, C24-54 Branched and Linear, Alpha (even-numbered carbons)

Result

In a pre-test study, the test material was administered at 5000 mg/kg. The animals died due to physical overloading of the digestive system, therefore, 2000 mg/kg was selected as the dose level for the definitive study.

In the 2000 mg/kg dose group, one animal died on day two due to trauma resulting from the dosing procedure. No adverse effects were noted in body weight gains among the surviving test and control animals. All animals exhibited impaired coordination in the first three hours following dosing. This reaction was due to the residual effects of the anesthetic. No remarkable findings were noted among the control animals throughout the remainder of the observational period. Clinical observations consisted of yellow staining of the inguinal region in five animals, yellow staining around the mouth in three animals, and labored respiration and excessive salivation in one animal. These findings cleared in two days. While no adverse effects that could be attributed to test material administration were noted at necropsy, the following observations were made: five animals had congestion in their left sub-lumbar lymph nodes, one animal had a small white object lodged in its stomach, one animal had an empty stomach, and one animal had congestion in the upper 1 cm of its duodenum. For the control group, one animal had congestion in its left sub-lumbar lymph node, one animal had a congested thymus, and one animal had no gastro-intestinal contents.

All deaths that occured during the conduct of the study were attributed to trauma and therefore did not contribute to the toxicity of the compound. The acute oral LD50 for Alpha Olefin C30+ was determined to be greater than 2000 mg/kg.

Test condition

C30+ Alpha Olefin was formed into dosing pellets by heating to its melting point, drawing it into a thin-walled plastic tube, allowing it to solidify and extruding the solid pellets. Fisher 344 albino rats (5 male and 5 female) were anesthetized with approximately 40 mg/kg of Ketamine hydrochloride given intramuscularly. A thin-walled plastic tube was then inserted down the animal's esophagus and pellets of test material were pushed through the tube and into the animal's stomach using a wooden applicator stick. Three males and two females served as a procedural control group. The dose level was 2000 mg/kg. The animals were observed for 14 days.

Conclusion	The acute oral LD50 for Alpha Olefin C30+ was determined to be greater than 2000 mg/kg.
Reliability	(2) valid with restrictions This study meets the current OECD 40 1 guideline with restrictions due to the non-standard dosing procedure and the administration of an anesthetic.
Flag	confidential
12.02.2001	Gulf Life Sciences Center, (1982). Acute Oral Toxicity Test in Albino Rats, unpublished report.

CAS No. 26952-14-7
Biodegradation

Type	aerobic
Inoculum	other: none
Contact time	28 day
Degradation	= 48 - % after 28 day
Result	other: Does not meet the strict criteria of readily biodegradability
Kinetic of Test substance	7 day = 19 - % 14 day = 31 - % 21 day = 44 - % 28 day=48 - % - %
Control substance	other: Sodium benzoate
Kinetic	14 day = 58 - % 28 day = 85 - %
Deg. Product	
Method	other: "Marine BODIS" ISO/TC 147/SC 5/WG 4N 141
Year	1999
GLP	no
Test substance	other TS: C 16-C 18 Alpha Olefin, Isomerized
Result	The test material achieved 48% biodegradation in 28 days. Ther reference oil achieved 34% degradation in 28 days.
Test condition	This method used natural seawater fortified with mineral nutrients and no inoculum was added in addition to the micro-organisms already present in the seawater. The test vessels were closed glass bottles with a known volume of aqueous test mixture (66.6%) and air (33.3%). They were shaken continuously to assure steady state oxygen partitioning between the aqueous and gaseous phase. The

degradation was followed by weekly measurements of the BOD in the aqueous phase for a 28 day period. The test vessels were re-aerated and resealed after measurement. The total oxygen uptake in the test flasks was calculated from the measured oxygen concentration divided by the saturation value at normal conditions and multiplied with the total oxygen content originally present in the aqueous and gaseous phases.

Three replicates were used for each test condition: test substance, controls, and insoluble reference substance. The total oxygen capacity of each test vessel was 26.64 mg oxygen. Sodium benzoate was used as the soluble reference substance at a concentration of 20 mg of theoretical oxygen demand (ThOD) per test vessel.

An inert support medium, chromatography silica powder, was used to provide a large and controlled surface area for the poorly-soluble test substance and reference substance (an olefin oil) The silica powder) and test material were made into a homogenate and added to the test vessel before addition of the test medium. One gram of support medium containing 20 mg of ThOD of test substance or insoluble reference substance was used for each test vessel. The ThOD for the test substance was 0.34 mg oxygen/mg and the addition rate was 4 mg/test vessel.

The following controls were included: Background oxygen consumption in test medium, background oxygen consumption in test medium with clean silica powder.

Validity criteria stated: Temperature = 19-2 1oC, Soluble reference is >60% in 14 days, and Cumulative blank oxygen consumption is <30% of oxygen initially available. The Reference insoluble material is expected to achieve 2545% in 28 days.

Conclusion The test material achieved 47% biodegradation in 28 days.

Reliability (2) valid with restrictions
This study does not meet the validity criteria stated in the report. The Soluble reference, sodium benzoate only achieved 58% degradation by Day 14, instead of 60%.

Flag confidential

21.02.2001 Environment & Resource Technology Ltd., 1999. Assessment of ready aerobic degradability in seawater. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 26952-14-7
Fish Acute

Type semistatic
Species other: Scophthalmus maximus (turbot)
Exposure period 96 hour(s)

Unit	mg/l
Analytical Monitoring	
LC50	> 10000 -
Method	OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year	1997
GLP	yes
Test substance	other TS: C 16-C 18 Alpha Olefin, Isomerized
Result	After 96 hours, no mortality was observed at the maximum dose level of 10,000 mg/L, therefore, the LC50 was greater than 10,000 mg/L.
Test condition	Based on range-finding data, the definitive test (semi-static) were conducted on 5 dose levels (1000, 1800, 3200, 5600, and 10000) and a control. Juvenile turbot of approximately 3cm in length were used in all tests. All fish were maintained in controlled conditions of approximately 1 8oC with constant illumination. The tests were conducted in 14L capacity moulded soda-lime glass tanks containing 10 liters of test media. The test material was added directly to the appropriate tank and the test media was replaced at 48 hours. A single vessel was used per test concentration and gentle aeration was supplied. Ten animals were exposed per test concentration for 96 hours with observations being conducted at 24 hour intervals.
Conclusion	After 96 hours, no mortality was observed at the maximum dose level of 10,000 mg/L, therefore, the LC50 was greater than 10,000 mg/L.
Reliability	(2) valid with restrictions This study meets the current OECD 203 guideline with restrictions due to the use of constant illumination during the study instead of the recommended 12-16 hour photoperiod.
Flag	confidential
15.02.2001	Environment & Resource Technology Ltd., 1997. Assessment of the aquatic-phase to the marine fish, Scopthalmus maximus. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 26952-14-7
Oral

Type	LD50
Species	rat
Strain	other: HSD: SD
Sex	male/female
Number of Animals	10

Vehicle	other: none
Value	> 5050 - mg/kg bw
Method	EPA OPP 81-1
Year	1993
GLP	yes
Test substance	other TS: Cl6 Alpha Olefin, Isomerized
Result	No deaths were observed. All animals gained weight during the study. Signs of toxicity included activity decrease, piloerection and polyuria, which were no longer evident by Day 7. Alopecia was observed in all animals on Days 7 through 14. The gross necropsy conducted on all animals at termination of the study revealed no observable abnormalities in any of the animals. The acute oral LD50 was greater than 5050 mg/kg.
Test condition	Single doses of 5050 mg/kg of undiluted test material were administered intragastrically to groups of 5 male and 5 female fasted albino rats. Animals were observed for 14 days. Individual body weights were recorded on Days 0, 7, and 14. A gross necropsy was performed on each animal at the termination of the study.
Conclusion	The acute oral LD50 of Cl6 Alpha Olefin, Isomerized was greater than 5050 mg/kg. There was no mortality during the study.
Reliability	(1) valid without restriction
Flag	confidential
14.02.2001	Stillmeadow, Inc., (1993). Acute Oral Toxicity Study in Rats. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 26952-14-7
Dermal

Type	LD50
Species	rabbit
Strain	New Zealand white
Sex	male/female
Number of Animals	10
Vehicle	other: none
Value	> 2020 - mg/kg bw
Method	EPA OPP 8 1-2
Year	1993
GLP	yes
Test substance	other TS: C 16 Alpha Olefin, Isomerized
Result	One male died on Day 14 after final observations had been made, but it was not considered to be test material related. All other animals appeared normal for the

duration of the study and gained weight. The gross necropsy conducted on each animal at termination of the study revealed no observable abnormalities in any of the animals. The acute dermal LD50 was greater than 2020 mg/kg.

Test condition The objective of this study was to determine the acute dermal toxicity potential of the test material. Each animal was prepared on the day prior to treatment by clipping the dorsal surface of the trunk free of hair to expose not less than 10% of the total body surface area. Five albino rabbits of each sex were treated with a single dermal application of 2020 mg/kg of undiluted test material for 24 hours. The treated area was covered with gauze and a semi-permeable dressing (orthopedic stockinette) to retard evaporation of volatile substances and to prevent possible ingestion of the test material. After 24 hours the wrappings and gauze were removed from the animals. The exposed areas were gently washed with room temperature tap water and a clean wet cloth was used to remove as much remaining test material as possible. Animals were observed for 14 days. Individual body weights were recorded on Days 0, 7, and 14. A gross necropsy was conducted on each animal at the termination of the study.

Conclusion The acute dermal LD50 of Cl6 Alpha Olefin, Isomerized was greater than 2020 mg/kg.

Reliability (1) valid without restriction

Flag confidential

14.02.2001 Stillmeadow, Inc., (1993). Acute Dermal Toxicity Study in Rabbits. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 27070-58-2
Biodegradation

Type	aerobic
Inoculum	other: none
Contact time	28 day
Degradation	= 48 - % after 28 day
Result	other: Does not meet the strict criteria of readily biodegradability
Kinetic of Test substance	7 day = 19 - % 14 day = 31 - % 21 day = 44 - % 28 day = 48 - % - %
Control substance	other: Sodium benzoate
Kinetic	14 day = 58 - % 28 day = 85 - %

Deg. Product Method	other: IS0 "Marine BODIS" ISO/TC 147/SC 5/WG 4N 1415
Year	1999
GLP	no
Test substance	other TS: C 16-l 8 Alpha Olefin, Isomerized
Result	The test material achieved 48% biodegradation in 28 days. The reference oil achieved 34% degradation in 28 days.
Test condition	This method used natural seawater fortified with mineral nutrients and no inoculum was added in addition to the micro-organisms already present in the seawater. The test vessels were closed glass bottles with a known volume of aqueous test mixture (66.6%) and air (33.3%). They were shaken continuously to assure steady state oxygen partitioning between the aqueous and gaseous phase. The degradation was followed by weekly measurements of the BOD in the aqueous phase for a 28 day period. The test vessels were re-aerated and resealed after measurement. The total oxygen uptake in the test flasks was calculated from the measured oxygen concentration divided by the saturation value at normal conditions and multiplied with the total oxygen content originally present in the aqueous and gaseous phases. Three replicates were used for each test condition: test substance, controls, and insoluble reference substance. The total oxygen capacity of each test vessel was 26.64 mg oxygen. Sodium benzoate was used as the soluble reference substance at a concentration of 20 mg of theoretical oxygen demand (ThOD) per test vessel. An inert support medium, chromatography silica powder, was used to provide a large and controlled surface area for the poorly-soluble test substance and reference substance (an olefin oil) The silica powder) and test material were made into a homogenate and added to the test vessel before addition of the test medium. One gram of support medium containing 20 mg of ThOD of test substance or insoluble reference substance was used for each test vessel. The ThOD for the test substance was 0.34 mg oxygen/mg and the addition rate was 4 mg/test vessel. The following controls were included: Background oxygen consumption in test medium, background oxygen consumption in test medium with clean silica powder. Validity criteria stated: Temperature = 19-2 loC, Soluble reference is >60% in 14 days, and Cumulative blank oxygen consumption is <30% of oxygen initially available. The Reference insoluble material is expected to achieve 25-45% in 28 days.
Conclusion	The test material achieved 47% biodegradation in 28 days.
Reliability	(2) valid with restrictions

This study does not meet the validity criteria stated in the report. The Soluble reference, sodium benzoate only achieved 58% degradation by Day 14, instead of 60%.

Flag confidential

20.02.2001 Environment & Resource Technology Ltd., 1999. Assessment of ready aerobic degradability in seawater. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 27070-58-2
Fish Acute

Type	semistatic
Species	other: Scophthalmus maximus (turbot)
Exposure period	96 hour(s)
Unit	mg/l
Analytical Monitoring	
LC50	> 10000 -
Method	OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year	1997
GLP	yes
Test substance	other TS: C 16-C 18 Alpha Olefin, Isomerized

Result After 96 hours, no mortality was observed at the maximum dose level of 10,000 mg/L, therefore, the LC50 was greater than 10,000 mg/L.

Test condition Based on range-finding data, the definitive test (semi-static) were conducted on 5 dose levels (1000, 1800, 3200, 5600, and 10000) and a control. Juvenile turbot of approximately 3cm in length were used in all tests. All fish were maintained in controlled conditions of approximately 18oC with constant illumination. The tests were conducted in 14L capacity moulded soda-lime glass tanks containing 10 liters of test media. The test material was added directly to the appropriate tank and the test media was replaced at 48 hours. A single vessel was used per test concentration and gentle aeration was supplied. Ten animals were exposed per test concentration for 96 hours with observations being conducted at 24 hour intervals.

Conclusion After 96 hours, no mortality was observed at the maximum dose level of 10,000 mg/L, therefore, the LC50 was greater than 10,000 mg/L.

Reliability (2) valid with restrictions
This study meets the current OECD 203 guideline with restrictions due to the use of constant illumination during the study instead of the recommended 12- 16 hour photoperiod.

Flag confidential

Flag	confidential
15.02.2001	Environment & Resource Technology Ltd., 1997. Assessment of the aquatic-phase to the marine fish, Scopthalmus maximus. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 27070-58-2
Oral

Type	LD50
Species	rat
Strain	other: HSD:SD
Sex	male/female
Number of Animals	10
Vehicle:	other: none
Value	> 5050 - mg/kg bw
Method	EPA OPP 81-1
Year	1993
GLP	yes
Test substance	other TS: C 18 Alpha Olefin, Isomerized
Result	No deaths were observed. All animals gained weight during the study. Signs of toxicity included diarrhea, piloerection and polyuria, which were no longer evident by Day 11. The gross necropsy conducted on all animals at termination of the study revealed no observable abnormalities in any of the animals. The acute oral LD50 was greater than 5050 mg/kg.
Test condition	Single doses of 5050 mg/kg of undiluted test material were administered intragastrically to groups of 5 male and 5 female fasted albino rats. Animals were observed for 14 days. Individual body weights were recorded on Days 0, 7, and 14. A gross necropsy was performed on each animal at the termination of the study.
Conclusion	The acute oral LD50 of C 18 Alpha Olefin, Isomerized was greater than 5050 mgikg. There was no mortality during the study.
Reliability	(1) valid without restriction
Flag	confidential
14.02.2001	Stillmeadow, Inc., (1993). Acute Oral Toxicity Study in Rats. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 27070-58-2
Dermal

Type	LD50
Species	rabbit
Strain	New Zealand white
Sex	male/female
Number of Animals	10
Vehicle	other: none
Value	> 2020 - mg/kg bw
Method	EPA OPP 8 l-2
Year	1993
GLP	yes
Test substance	other TS: C 18 Alpha Olefin, Isomerized
Result	There was no mortality during the study. Dermal irritation was noted throughout the observation period. A reduction in body weight gain was observed in both sexes between Days 7 and 14. A single female animal had diarrhea on Days 9 and 10. The gross necropsy conducted on each animal at termination of the study revealed no observable abnormalities in any of the animals. The acute dermal LD50 was greater than 2020 mg/kg.
Test condition	The objective of this study was to determine the acute dermal toxicity potential of the test material. Each animal was prepared on the day prior to treatment by clipping the dorsal surface of the trunk free of hair to expose not less than 10% of the total body surface area. Five albino rabbits of each sex were treated with a single dermal application of 2020 mg/kg of undiluted test material for 24 hours. The treated area was covered with gauze and a semi-permeable dressing (orthopedic stockinette) to retard evaporation of volatile substances and to prevent possible ingestion of the test material. After 24 hours the wrappings and gauze were removed from the animals. The exposed areas were gently washed with room temperature tap water and a clean wet cloth was used to remove as much remaining test material as possible. Animals were observed for 14 days. Individual body weights were recorded on Days 0, 7, and 14. A gross necropsy was conducted on each animal at the termination of the study.
Conclusion	The acute dermal LD50 of C 18 Alpha Olefin, Isomerized was greater than 2020 mg/kg.
Reliability	(1) valid without restriction
Flag	confidential
14.02.2001	Stillmeadow, Inc., (1993). Acute Dermal Toxicity Study in Rabbits. Conducted for Chevron Chemical Company, unpublished report.

CAS No. 182636-03-9
Biodegradation

Type	aerobic
Inoculum	other: sewage sludge, predominantly domestic
Concentration	10mg/l related to DOC (Dissolved Organic Carbon) 11.6mg/l related to Test substance
Contact time	28 day
Degradation	92 - % after 28 day
Result	readily biodegradable
Kinetic of Test substance	1 day = 4 - % 3 day = 15 - % 10 day = 53 - % 16 day = 83 - % 28 day = 92 - %
Control substance	Benzoic acid, sodium salt
Kinetic	14 day = 96 - % 28 day = 100 - %
Deg. Product	not measured
Method	OECD Guide-line 301 B "Ready Biodegradability: Modified Sturm Test (CO_2 evolution)"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)
Result	The test material attained a total of 92% degradation during the test with >60% occuring within 10 days of the degradation reaching 10%. Toxicity control attained 100% degradation after 28 days confirming that the test material was not toxic to sewage treatment microorganisms used in the study. All validity criteria required were achieved; therefore, C20-24 Alkenes, Branched and Linear can be considered to be readily biodegradable under the strict terms and conditions of OECD Guideline No. 30 1 B
Test condition	A study was performed to assess the ready biodegradability of the test material in an aerobic aqueous media. The test material was exposed to sewage sludge microorganisms at a concentration of 10 mg C/L with culture medium in sealed culture vessels in the dark at 2 1oC for 28 days. The degradation of the test material was assessed by the determination of carbon dioxide produced. Control solutions with inoculum and the standard material, sodium benzoate, together with a toxicity control, were used for validation purposes. The validation criteria for this study were: The standard material yields >=60% degradation by day 14.

The test material may be considered to be readily biodegradable if >=60% degradation is attained after 28 days. This level of degradation must be reached within 10 days of biodegradation exceeding 10%.

The toxicity control should attain >=25% degradation by day 14 for the test material to be considered as non-inhibitory.

The difference of the extremes of replicate values of production of CO2 at the end of the test is less than 20%.

The total CO2 evolution in the control vessels at the end of the test should not normally exceed 40 mg/L medium.

The Inorganic Carbon content of the test material in the culture media must be less than 5% of the Total Carbon on day 0.

Conclusion C20-24 Alkenes, Branched and Linear can be considered to be readily biodegradable under the strict terms and conditions of OECD Guideline No. 301B

Reliability (1) valid without restriction

Flag confidential

14.02.2001 SafePharm Laboratories Limited, (1998). Assessment of Ready Biodegradability; CO2 Evolution Test. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-g
Fish Acute

Type	semistatic
Species	Oncorhynchus mykiss (Fish, fresh water)
Exposure period	96 hour(s)
Unit	mg/l
Analytical Monitoring	yes
NOEC	>= 1000 -
LC50	> 1000 -
Method	OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result	In the Range-finding study the results showed no mortalities at the 10, 100, and 1000 mg/L loading rate Water Accommodated Fractions (WAF's). The results of the definitive study showed the highest loading rate WAF resulting in 0% mortality to be greater that or equal to 1000 mg/L, the lowest loading rate WAF resulting in 100% mortality to be greater than 1000 mg/L and the No Observed Effect Concentration (NOEC) to be greater than or equal to 1000 mg/L loading rate WAF. The No Observed Effect Concentration is based upon zero mortalities and the absence of any adverse effects of exposure at this concentration. Analysis of the WAF was carried out by Total Organic Carbon (TOC) analysis on samples from each of two replicate vessels of the treated and the control media at the beginning and end of the first 24 hours of the test. The results of the TOC analysis showed that, compared to the controls, no significant levels of carbon were detected in the WAFs.
Test condition	A study was performed to assess the acute toxicity of the test material, C20-24 Alkenes, Branched and Linear, to rainbow trout. Following a preliminary range-finding study, fish were exposed, in three groups of ten, to a Water Accommodated Fraction (WAF) of the test material for a period of 96 hours. A semi-static test regime was employed in the study involving a daily renewal of the test preparations to ensure that the concentrations of the test material remained near nominal and to prevent the build up of nitrogenous waste products. The WAF was prepared by placing the test material on the surface of water to give a 1000 mg/L loading rate which was then stirred with a magnetic stirrer to achieve a vortex depth of approximately 5% of the distance to the bottom of the vessel, for 24 hours. The mixture was then allowed to stand for 4 hours prior to removing the aqueous phase or WAF by siphon. The number of mortalities and any adverse reactions to exposure in each test and control vessel were determined 3 and 6 hours after the start of exposure and then daily throughout the study until termination after 96 hours. Duplicate control groups were maintained under identical conditions but not exposed to the test material. The vessels received no auxiliary aeration and were covered to reduce evaporation.
Conclusion	The 96-hour median Lethal Leading Rate (LLR50) for the test material to rainbow trout (Oncorhynchus mykiss), based on nominal loading rates, was greater than 1000 mg/L loading rate Water Accommodated Fraction and correspondingly the No Observed Effect Concentration was greater than or equal to 1000 mg/L loading rate Water Accommodated Fraction.
Reliability	(1) valid without restriction
Flag	confidential
12.02.2001	SafePharm Laboratories Limited, (1998). Acute Toxicity To Rainbow Trout. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-g
Daphnia

Type	static
Species	Daphnia magna (Crustacea)
Exposure period	48 hour(s)
Unit	mg/l
Analytical Monitoring	yes
NOEC	>= 1000 -
EC50	> 1000 -
Method	OECD Guide-line 202, part 1 "Daphnia sp., Acute Immobilisation Test"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result

In the Range-finding study the results showed no immobilization at the 10, 100, and 1000 mg/L loading rate Water Accommodated Fractions (WAF).

In the Definitive study, there was no immobilization in 40 daphnids exposed to a 1000 mg/L loading rate WAF for a period of 48 hours.

The No Observed Effect Concentration after 24 and 48 hours exposure was greater than or equal to 1000 mg/L loading rate WAF. The No Observed Effect Concentration is based upon zero immobilization at this concentration.

Analysis of the Water Accommodated Fractions was carried out by Total Organic Carbon (TOC) analysis on the test preparation at 0 and 48 hours. The results of the TOC analysis showed that compared to the controls, no significant levels of carbon were detected in the WAFs.

Test condition

A study was performed to assess the acute toxicity of the test material, C20-24 Alkenes, Branched and Linear, to Daphnia magna. Following a preliminary range-finding study, forty daphnids (4 replicates of 10 animals) were exposed to a Water Accommodated Fraction (WAF) of the test material for 48 hours under static test conditions. The WAF was prepared by placing the test material on the surface of the water to give a 1000 mg/L loading rate which was then stirred by magnetic stirrer to achieve a vortex depth of approximately 5% of the distance to the bottom of the vessel for 24 hours. The mixture was then allowed to stand for 4 hours prior to removing the aqueous phase or WAF by siphon. Immobilization and any adverse reactions to exposure were recorded after 24 and 48 hours. Replicate control groups were maintained under identical conditions but not exposed to the test material. The vessels received no auxiliary aeration and were covered to reduce evaporation.

Conclusion

The 48-hour median Effective Loading Rate (ELR50) for the test material to Daphnia magna, based on nominal loading rates, was greater than 1000 mg/L loading rate Water Accommodated Fraction and correspondingly the No

	Observed Effect Concentration was greater than or equal to 1000 mg/L loading rate Water Accommodated Fraction.
Reliability	(1) valid without restriction
Flag	confidential
12.02.2001	SafePharm Laboratories Limited, (1998). Acute Toxicity To Daphnia Magna. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-9
Algae

Species	Selenastrum capricornutum (Algae)
Endpoint	growth rate
Exposure period	96 hour(s)
Unit	mg/l
Analytical Monitoring	yes
OEC	>= 1000 -
EC50	> 1000 -
Method	OECD Guide-line 20 1 "Algae, Growth Inhibition Test"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)
Result	In the Range-finding study the results showed no effect on growth at either concentration, 100 or 1000 mg/L Water Accommodated Fraction (WAF). From the results of the definitive study neither the growth or the biomass of Pseudokirchneriella subcapitata (formerly Selenastrum capricornutum) were affected by the presence of the test material over the 96-hour exposure period. All test and control cultures were inspected microscopically at 96 hours. Ther were no abnormalities detected in any of the control or test cultures. Analysis of the WAF was carried out by Total Organic Carbon (TOC) analysis on samples from two replicate vessels of treated and control media at the beginning and end of the test. The results of the TOC analysis showed that, compared to the controls, no significant levels of carbon were detected in the WAFs.
Test condition	A study was performed to assess the effect of the test material, C20-24 Alkenes, Branched and Linear, on the growth of Pseudokirchneriella subcapitata (formerly Selenastrum capricornutum). Following a preliminary range-finding study, Pseudokirchneriella subcapitata was exposed to a Water Accommodated Fraction (WAF) of the test material (six replicate flasks) for 96 hours under constant

illumination and shaking at a temperature of 240C. The WAF was prepared by placing the test material on the surface of the water to give a 1000 mg/L loading rate which was then stirred to achieve a vortex depth of approximately 5% of the distance to the bottom of the vessel for 24 hours. The mixture was then allowed to stand for 4 hours prior to removing the aqueous phase or WAF by siphon. Samples of the algal populations were removed daily, and algal cell concentrations were determined, using an electronic cell counter, for each control and treatment group. Triplicate control groups were maintained under identical conditions but not exposed to the test material.

At the initiation of the study, the algal suspension culture contained a nominal cell density of 10,000 cells per mL.

A Student's t-test was carried out on the area under the growth curve data at 96 hours for the control and 1000 mg/L loading rate WAF test concentration to determine any statistically significant differences between the test and control groups.

Conclusion Exposure of Pseudokirchneriella subcapitata (formerly Selenastrum capricornutum) to the test material gave median Effective Loading Rate (ELR50) values of greater than 1000 mg/L loading rate Water Accommodated Fraction and correspondingly the No Observed Effect Concentration was greater than or equal to 1000 mg/L loading rate Water Accommodated Fraction.

Reliability (1) valid without restriction

Flag confidential

12.02.2001 SafePharm Laboratories Limited, (1998). Algal Inhibition Test. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-g
Oral

Type	LD50
Species	rat
Strain	other: Sprague-Dawley CD (Crl:CD®BR)
Sex	male/female
Number of animals	10
Vehicle	other: none
Value	> 5000 - mg/kg bw
Method	OECD Guide-line 40 1 "Acute Oral Toxicity"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result Surviving animals recovered 1 - 3 days after dosing. One female was found dead one day after dosing. Clinical observations noted in all animals during the day of dosing were hunched posture and pilo-erection. Decreased respiratory rate and

laboured respiration were noted in one female during the day of dosing. Hunched posture persisted in six animals one day after dosing, with ataxia noted in two females and tiptoe gait in one female. Hunched posture was noted in two females two days after dosing.

Abnormalities noted at necropsy of the female that died during the study were hemorrhagic lungs, dark liver and dark kidneys. No abnormalities were noted at necropsy of animals that were killed at the end of the study. Surviving animals showed expected gain in bodyweight during the study.

Test condition The test material was administered by oral gavage as a single limit dose of 5000 mg/kg body weight to a group of 10 fasted animals, 5 males and 5 females. Individual bodyweights were recorded prior to dosing on Day 0 and on Days 7 and 14 or at death. Surviving animals were observed for 14 days after dosing and then sacrificed. All animals were subjected to a gross necropsy. The specific gravity of the test material was 0.796 and the dose volume was adjusted accordingly. This dose level was selected based upon data derived from a range-finding study of 1 male and 1 female.

Conclusion The acute oral median lethal dose (LD50) of the test material, C20-C24 Alkenes, Branched and Linear, in the Sprague-Dawley CD strain rat was found to be greater than 5000 mg/kg bodyweight.

Reliability (1) valid without restriction

Flag confidential

12.02.2001 SafePharm Laboratories Limited, (1998). Acute Oral Toxicity Study in The Rat. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-9
Dermal

Type	LD50
Species	rat
Strain	other: Sprague-Dawley CD (Crl:CD®BR)
Sex	male/female
Number of animals	10
Vehicle	other: none
Value	> 2000 - mg/kg bw
Method	OECD Guide-line 402 "Acute dermal Toxicity"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result There were no deaths. No signs of systemic toxicity or skin irritation were noted during the study. All animals showed expected gain in bodyweight during the study. No abnormalities were noted at necropsy. The acute dermal median lethal

dose (LD50) of the test material in the Sprague-Dawley strain rat was found to be greater than 2000 mg/kg bodyweight.

Test condition A study was performed to assess the acute dermal toxicity of the test material in the Sprague-Dawley strain rat. A group of ten animals (five males and five females) was given single, 24-hour, semi-occluded, dermal applications to intact skin at a dose level of 2000 mg/kg bodyweight. The animals were observed for fourteen days after the day of treatment and were then killed for gross pathological examination.

Conclusion The acute dermal median lethal dose (LD50) of the test material in the Sprague-Dawley strain rat was found to be greater than 2000 mg/kg bodyweight.

Reliability (1) valid without restriction

Flag confidential

12.02.2001 SafePharm Laboratories Limited, (1998). Acute Dermal Toxicity Study in The Rat. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-9
Oral

Species	rat
Sex	male/female
Strain	other: (Crl: CD BR)
Route of admin	gavage
Exposure period	13 Weeks
Frequency of Treatment	Daily
Post obs. period	4 Weeks
Doses	100,500, and 1000 mg/kg/day
Control group	yes, concurrent vehicle
NOAEL	1000 - mg/kg bw
Method	OECD Guide-line 408 "Subchronic Oral Toxicity - Rodent: 90-day Study"
Year	1999
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result There were no deaths during the study. No clinical signs or effects on bodyweight or food intake were seen. No opthalmological or neurobehavioral effects were noted. Treatment was associated with slight yet reversible changes in haematological parameters (lower packed cell volume of males and females, lower haemoglobin levels of males, lower erythrocyte count of females and longer clotting times of males) and biochemical markers (higher glucose levels). These effects were considered to be of no toxicologic importance.

Minimal, adaptive hepatic changes (centrilobular hepatocyte hypertrophy)

associated with higher liver weight, were detected for females receiving 1000 mg/kg/day. Minimal adrenal cortical hypertrophy and increased adrenal weight were noted amongst females receiving 1000 mg/kg/day. An increased incidence of minimal or slight epithelial hyperplasia in the stomach was noted amongst males receiving 1000 mg/kg/day which could be associated with the route of administration. These findings were not present following a 4-week recovery period.

The "No Observed Adverse Effect Level" (NOAEL) was considered to be 1000 mg/kg/day.

Test condition

In a preliminary Range-finder study, test material was administered by gavage to a group of 3 male and 3 female Sprague-Dawley **CD** strain rats for twenty-eight consecutive days at a dose level of 1000 mg/kg/day. A control group of 3 males and 3 females remained untreated throughout the study period but was otherwise handled in an identical manner to the test animals. No treatment-related changes in the parameters measured were found. The "No Observed Effect Level" (NOEL) is therefore considered to be 1000 mg/kg/day.

In the 13-Week Study with 28-Day Recovery Period, the test material was administered by gavage to groups of 20 male and 20 female Sprague-Dawley CD strain rats at 1000 mg/kg/day and 10 animals of each sex at 100 and 500 mg/kg/day for a period of 13 weeks. A control group of 20 males and 20 females received the vehicle, corn oil. At the end of the 13-week treatment period 10 males and 10 females from each group were sacrificed; the remaining 10 male and 10 female animals from the control and high dose groups were maintained, undosed for a 4-week period to assess recovery. Clinical signs, bodyweight, and food and water consumption were monitored during the study, and ophthalmoscopy and neurobehavioral screening were performed.

Conclusion

The No Observed Adverse Effect Level (NOAEL) was considered to be 1000 mg/kg/day.

Reliability

(1) valid without restriction

Flag

confidential

12.02.2001

Huntingdon Life Sciences, (1999). Toxicity Study By Oral Gavage Administration to CD Rats for 13 Weeks Followed by a 4-Week Recovery Period. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-g
Genetic Toxicity

Type

other: Salmonella typhimurium and Escherichia coli/Mammalian-Microsome Reverse Mutation Assay

System of testing

Bacterial

Concentration

0, 15, 50, 150, 500, 1500, 5000 ug/plate

Cycotoxic conc.	> 5000 ug/plate
Metabolic activation	with and without
Result	negative
Method	OECD Guide-line 47 1 "Genetic Toxicology: Salmonella thyphimurium Reverse Mutation Assay"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)
Result	The test material caused no visible reduction in the growth of the bacterial lawn at any dose level either with or without metabolic activation. The test material was therefore tested up to a maximum recommended dose level of 5000 ug/plate. A precipitate was observed at and above 1500 ug/plate; this however did not interfere with the scoring of revertant colonies. No significant increase in the frequency of revertant colonies was recorded for any of the bacterial strains with any dose of the test material, either with or without metabolic activation. The vehicle (acetone) and untreated control plates produced counts of revertant colonies within the normal range. Ail of the positive control chemicals used in the test induced marked increases in the frequency of revertant colonies and the activity of the S9 fraction was shown to be satisfactory. The test material was found to be nonmutagenic under the conditions of this test.
Test condition	Salmonella typhimurium strains TA1535, TA1537, TA98, and TA100 and Escherichia coli strain WP2uvrA- were treated with the test material using the Ames plate incorporation method at six dose levels, in triplicate, both with and without the addition of a rat liver homogenate metabolizing system (10% liver S9 in standard co-factors). The dose range was determined in a preliminary toxicity assay and was 15 to 5000 @plate in the first experiment. A second experiment was performed on a separate day using the same dose range as Experiment 1, fresh cultures of the bacterial strains, and fresh chemical formulations. Vehicle (acetone), untreated (negative) and positive controls were included in each experiment. For the test, 0.1 mL of bacterial culture, 2.0 mL of top agar, 0.1 mL of the test material formulation, vehicle or positive control and either 0.5 mL of S9 mix or phosphate buffer was mixed together and poured onto the surface of a Vogel-Bonner Minimal agar plate. The plates were incubated for 48 hours at 37C after an initial overnight equilibration period and the frequency of revertant colonies was assessed. For a substance to be considered positive in this test system, it should have induced a dose-related and statistically significant increase in the revertant count in one or more strains of bacteria in the presence and/or absence of S9 in both experiments. To be considered negative, the number of revertants at each dose level should have been less than twofold the vehicle control frequency for

TA100, TA98 and WP2uvrA- and threefold for TA1535 and TA1537. Statistical significance was analyzed using the methods recommended by the UKEMS [Reference: Kirkland, D.J., Ed., Statistical Evaluation of Mutagenicity Test Data, UKEMS sub-committee on Guidelines for Mutagenicity Testing. Report Part III (1989) Cambridge University Press.].

Conclusion C20-24 Alkenes, Branched and Linear, was not mutagenic in this test.

Reliability (1) valid without restriction

Flag confidential

12.02.2001 SafePharm Laboratories Limited, (1998). Salmonella Typhimurium and Escherichia Coli/Mammalian-Microsome Reverse Mutation Assay. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-03-9
Genetic Toxicity - in Vitro

Type	Chromosomal aberration test
System of testing	Human Lymphocyte
Concentration	39.06 - 5000 ug/ml
Cycotoxic conc.	> 5000 ug/ml
Metabolic activation	with and without
Result	negative
Method	OECD Guide-line 473 "Genetic Toxicology: In vitro Mammalian Cytogenetic Test"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result An oily layer on the surface of the media was observed at and above 3 12.5 ug/ml when dosed into media. Presence of an oily precipitate was also observed after spinning at both the washing and harvesting stage. There was no mitotic inhibition at any dose level assessed either in the absence or presence of S9.

All vehicle (solvent) controls gave frequencies of cells with aberrations within expected ranges.

All positive control treatments gave statistically significant increases in the frequency of cells with aberrations indicating the satisfactory performance of the test and the activity of the metabolising system.

The test material did not induce any statistically significant increases in the frequency of cells with chromosome aberrations or numbers of polyploid cells.

The test material was shown to be non-clastogenic to human lymphocytes in vitro.

Test condition

Human lymphocytes treated with the test material were evaluated for chromosome aberrations at five dose levels, in duplicate, together with vehicle (acetone) and positive controls. In experiment 1, cells were exposed for 4 hours, with and without the addition of an induced rat liver homogenate metabolizing system (S9 at 10% in standard co-factors, final concentration 1%), harvested 20 hours after treatment initiation. Results were confirmed in a second experiment with a 4-hour exposure with metabolic activation (at 20% in standard co-factors, final concentration 2%) and a 20-hour continuous exposure in the absence of activation, and harvest at 20 hours after treatment initiation. The dose levels selected for evaluation for chromosome aberrations (3 12.5, 625, 1250, 2500, and 5000 ug/ml) were selected on the basis of toxicity demonstrated by the mitotic index. Slides were coded and blindly scored. A total of 2000 lymphocyte cell nuclei were counted and the number of cells in metaphase recorded and expressed as the mitotic index and as a percentage of the vehicle control value. Where possible, the first 100 consecutive well-spread metaphases from each culture were counted, and if the cell had 44 or more chromosomes, any gaps, breaks or rearrangements were noted. The frequency of cells with aberrations (both including and excluding gaps) and the frequency of polyploid cells was compared, where necessary, with the concurrent vehicle control value using Fisher's Exact test.

Conclusion

The test material did not induce any statistically significant increases in the frequency of cells with chromosome aberrations or numbers of polyploid cells in either the presence or absence of a liver enzyme metabolising system in either of two separate experiments.

C20-24 Alkenes, Branched and Linear was considered to be non-clastogenic to human lymphocytes in vitro.

Reliability

(1) valid without restriction

Flag

confidential

14.02.2001

SafePharm Laboratories Limited (1998). Chromosome Aberration Test in Human Lymphocytes In Vitro, conducted for Chevron Research and Technology Company, unpublished report.

24.01.2001

CAS No. 182636-03-9
Genetic Toxicity

Type	Micronucleus assay
Species	mouse
Sex	male
Strain	CD-l

Route of admin.	i.p.
Exposure period	24 or 48 hours
Doses	500, 1000 and 2000 mg/kg
Result	negative
Method	OECD Guide-line 474 "Genetic Toxicology: Micronucleus Test"
Year	1998
GLP	yes
Test substance	other TS: C20-24 Alkenes, Branched and Linear (even-numbered carbons only)

Result

There were no premature deaths or clinical signs observed in any of the dose groups. There was no evidence of a significant increase in the incidence of micronucleated polychromatic erythrocytes in animals dosed with the test material when compared to the concurrent vehicle control groups. No statistically significant decreases in the PCE/NCE ratio were observed in the 24 or 48-hour test material dose groups when compared to their concurrent control groups.

The positive control material produced a marked increase in the frequency of micronucleated polychromatic erythrocytes.

The test material, C20-24 Alkenes, Branched and Linear, was considered to be non-genotoxic under the conditions of the test.

Test condition

A study was performed to assess the potential of the test material to produce damage to chromosomes or aneuploidy when administered via the intraperitoneal route to mice. Following a preliminary range-finding study in males and females which showed no adverse effects at 2000 mg/kg, the micronucleus study was conducted in males only, using the test material at the maximum recommended dose level of 2000 mg/kg with 1000 and 500 mg/kg as the lower two dose levels, In the micronucleus study, groups of seven male mice were given single intraperitoneal doses of the test material at 2000, 1000, and 500 mg/kg diluted with arachis oil. Further groups of mice were dosed via the intraperitoneal route with arachis oil (7 mice) or orally with cyclophosphamide (5 mice) to serve as vehicle and positive controls respectively.Animals were killed 24 hours (all doses and controls) and 48 hours (high dose and control only) after exposure. The bone marrow was extracted, and smear preparations were made and stained. The incidence of micronucleated cells per 2000 polychromatic erythrocytes per animal was scored. In addition, the number of normochromatic erythrocytes associated with 1000 erythrocytes were counted; these cells were also scored for incidence of micronuclei. A positive mutagenic response was demonstrated when a statistically significant and dose responsive increase in the number of micronucleated polychromatic erythrocytes was observed for either the 24 or 48-hour kill times when compared to their corresponding control group. A positive response for bone marrow toxicity was demonstrated when the dose group mean polychromatic to normochromatic ratio was shown to be statistically significantly lower than the concurrent vehicle control group. All data were statistically analysed using appropriate statistical methods as recommended by the UKEMS Sub-committee on Guidelines for Mutagenicity Testing Report, Part III (1989).

Conclusion

C20-24 Alkenes, Branched and Linear, was considered to be non-genotoxic under the conditions of the test.

Reliability	(1) valid without restriction
Flag	confidential
14.02.2001	SafePharm Laboratories Limited, (1998). Micronucleus Test in the Mouse. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 93924-10-s
Fish Acute

Type	semistatic
Species	Oncorhynchus mykiss (Fish, fresh water)
Exposure period	96 hour(s)
Unit	mg/l
Analytical Monitoring	yes
NOEC	= 560 -
LC50	> 1000 -
Method	OECD Guide-line 203 "Fish, Acute Toxicity Test"
Year	1993
GLP	yes
Test substance	other TS: C20-24 Alpha Olefin

Result

There were no mortalities observed during the study. Slight loss of equilibrium and lethargy were observed at the 100% WAF (1000 mg/L) only. The 96-hour LC50 was > 1000 mg/L loading rate WAF. The NOEC was =560 mg/L loading rate WAF.

Test condition

A study was performed to assess the acute toxicity of Gulftene 20-24 to rainbow trout (Oncorhynchus mykiss) under semistatic conditions (daily renewal).

The water accommodated fraction (WAF) was prepared by mixing 1000 mg/l of Gulftene 20-24 with water. The mixture was stirred on magnetic stirrers for 24 hours at 14°C and then allowed to settle for approximately 1 hour. The WAF was then withdrawn via a siphon prior to dilution to the required exposure levels and testing.

Water samples were taken from the control and each exposure level at 0 hours for test concentration verification. The concentrations were analyzed using an Ionics TC/TOC Analyser Model 555. Since the values obtained at 0 hours demonstrated that Total Carbon (dissolved) values for the exposure media were no higher than the control level, analysis was not carried out at other time points.

Groups of ten juvenile fish (5 test concentrations plus one control) were exposed for 96 hours to dilution series of a single WAF of Gulftene 20-24 (100 % WAF equivalent to 1000 mg/L). Supplementary aeration was provided. The test

	concentrations were 10, 18, 32, 56, and 100% WAF. Observations were made on the numbers of dead fish and the incidence of sub-lethal effects after 3, 6, 24, 72 and 96 hours exposure.
Conclusion	There were no mortalities observed during the study. The 96-hour LC50 was >1000 mg/L loading rate WAF. The NOEC was =560 mg/L loading rate WAF.
Reliability	(1) valid without restriction
Flag	confidential
15.02.2001	Huntingdon Research Centre, 1993. Gulftene 20-24 (water accommodated fraction) acute toxicity to rainbow trout. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 93924-10-g
Algae

Species	Selenastrum capricomutum (Algae)
Endpoint	growth rate
Exposure period	72 hour(s)
Unit	mg/l
Analytical Monitoring	yes
NOEC	>= 1000 -
EC50	> 1000 -
Method	OECD Guide-line 20 1 "Algae, Growth Inhibition Test"
Year	1993
GLP	yes
Test substance	other TS: C20-24 Alpha Olefin
Result	The mean cell density of the control at 0 hours was 8.25 x 10[4] cells/ml and at 72 hours was 2.78 x 10[6] cells/ml. All test and control cultures were inspected microscopically at 72 hours. There were no abnormalities detected. The 72-hour EbC50 was >1000 mg/L loading rate WAF. The 24-48-hour ErC50 was >1000 mg/L loading rate WAF. The NOEC was >=1000 mg/L loading rate WAF.
Test condition	The water accommodated fraction (WAF) was prepared by mixing 1000 mg/l Gulftene 20-24 with water. The mixture was stirred on a magnetic stirrer for 24 hours at 24°C and then allowed to settle for approximately 1 hour. The WAF was then withdrawn via a siphon and 100ml was measured into 250ml conical flasks. Flasks were prepared and 2ml of a concentrated algal suspension of Selenastrum capricomutum, (0.870 absorbance @ 665 nm) were added to each flask in order to produce the correct starting cell density. Algal cultures were exposed to 6 replicates of a single WAF of Gulftene 20-24 (100% WAF equivalent to 1000 mg/L). The exposed cultures plus one control (6 replicates) were incubated without media renewal on an orbital shaker under continuous

illumination at 24°C for 72 hours. Growth was monitored daily by measuring the absorbance of each culture. The cell densities at initiation and termination for the control were determined by direct counting with a haemocytometer.

Water samples were taken from the control and each exposure level at 0 hours for test concentration verification. The concentrations were analyzed using an Ionics TC/TOC Analyser Model 555. Since the values obtained at 0 hours demonstrated that Total Carbon (dissolved) values for the exposure media were no higher than the control level, analysis was not carried out at other time points.

Conclusion The 72-hour EbC50 was >1000 mg/L loading rate WAF. The 24-48-hour ErC50 was >1000 mg/L loading rate WAF. The NOEC was >=1000 mg/L loading rate WAF.

Reliability (1) valid without restriction

Flag confidential

15.02.2001 Huntingdon Research Centre, 1993. Gulftene 20-24 (water accommodated fraction) Algal Growth Inhibition. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 93924-10-8
Oral

Type	LD50
Species	rat
Strain	Fischer 344
Sex	male/female
Number of animals	10
Vehicle	other: corn oil
Value	> 5000 mg/kg bw
Method	other
Year	1982
GLP	yes
Test substance	other TS: C20-24 Alpha Olefin

Result No mortality was observed during the study. Clinical signs were limited to yellow staining of the inguinal region, oil around the mouth, and brown staining of the lower jaw; all had cleared by Day 5. No adverse findings were noted at necropsy. The acute oral LD50 is greater than 5000 mg/kg.

Test condition The test material was warmed to 37oC, diluted to 50% (w/v) with laboratory grade corn oil, and a dose equivalent to 5000 mg/kg of test substance was administered orally to 5 male and 5 female fasted rats. The animals received dose volumes of 2 ml/100g body weight. Body weights were recorded on Day 0 prior to dosing and on Days 7 and 14. All animals were observed for 14 days and a gross necropsy performed at study termination.

Conclusion	No mortality was observed during the study. No adverse findings were noted at necropsy. The acute oral LD50 is greater than 5000 mg/kg.
Reliability	(1) valid without restriction
Flag	confidential
15.02.2001	Gulf Life Sciences Center, (1982). Acute Oral Toxicity Test in Albino Rats, unpublished report.

CAS No. 1599-67-3
Oral

Type	LD50
Species	rat
Strain	Wistar
Sex	
Number of animals	30
Vehicle	other: corn oil
Value	> 5000 - mg/kg bw
Method	
Year	1967
GLP	no
Test substance	other TS: C22-28 Alpha Olefm (even-numbered carbons only)
Result	No deaths occurred during the study. The acute oral LD50 was >5000 mg/kg. No significant gross pathology was seen. Several days after dosing, treated animals developed very coarse, oily fur over nearly the entire body. At study termination increased body weights were 55%, 58% and 46% for the sham control, vehicle control and treated groups, respectively.
Test condition	The solid olefin C22-28 blend was administered to 10 rats weighing between 200 and 235 grams as a 25% w/v solution in corn oil. An additional group of 10 rats weighing between 200 and 232 grams received 20 ml/kg of corn oil as an internal control. A group of 10 rats weighing between 203 and 226 grams received nothing and served as the sham control. Animals were observed for 14 days. Bodyweights were taken at 1, 2, 3, 4, 7, and 14 days. Necropsies were performed at study termination.
Conclusion	No deaths occurred during the study. The acute oral LD50 was >5000 mg/kg.
Reliability	(2) valid with restrictions The animals were not fasted and were dosed at volumes >10 ml/kg. All required observation data is not presented.
Flag	confidential
21.02.2001	Department of Occupational Health, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania (1967). Toxicological studies

on several alpha olefins. Conducted for Gulf Research and Development Company, unpublished report.

CAS No. 182636-05-l
Biodegradation

Type	aerobic
Inoculum	other: sewage sludge, predominantly domestic
Concentration	10mg/l related to DOC (Dissolved Organic Carbon) 17.1mg/l related to Test substance
Contact time	28 day
Degradation	51 - % after 28 day
Result	other: not readily biodegradable
Kinetic of Test substance	1 day = 2 - % 5 day = 23 - % 14 day = 35 - % 21 day=38 - % 28 day = 51 - %
Control substance	Benzoic acid, sodium salt
Kinetic	14 day = 71 - % 28 day = 85 - %
Deg. Product	
Method	OECD Guide-line 301 B "Ready Biodegradability: Modified Sturm Test (CO2 evolution)"
Year	2000
GLP	yes
Test substance	other TS: C24-30 Alkenes, Branched and Linear (even-numbered carbons only)
Result	The test material attained a total of 5 1% degradation during the test. The toxicity control attained 5 1% degradation after 14 days confirming that the test material was not toxic to sewage treatment microorganisms used in the study. C24-30 Alkenes, Branched and Linear cannot be considered to be readily biodegradable under the strict terms and conditions of OECD Guideline No. 30 1B
Test condition	A study was performed to assess the ready biodegradability of the test material in an aerobic aqueous media. The test material was exposed to sewage sludge microorganisms at a concentration of 10 mg C/L with culture medium in sealed culture vessels in the dark at 210C for 28 days. Following the recommendations of the International Standards Organization, the test material was adsorbed onto granular silica gel prior to dispersion in the test medium in order to aid dispersion of the test material in the test medium and to increase the surface area of the test

material exposed to the test organisms. Silca gel was added to the control and standard material vessels in order to maintain consistency between these vessels and the test material vessels. The degradation of the test material was assessed by the determination of carbon dioxide produced. Control solutions with inoculum and the standard material, sodium benzoate, together with a toxicity control, were used for validation purposes.

The validation criteria for this study were:

The standard material yields >=60% degradation by day 14.

The test material may be considered to be readily biodegradable if >=60% degradation is attained after 28 days. This level of degradation must be reached within 10 days of biodegradation exceeding 10%.

The toxicity control should attain >=25% degradation by day 14 for the test material to be considered as non-inhibitory.

The difference of the extremes of replicate values of production of CO2 at the end of the test is less than 20%.

The total CO2 evolution in the control vessels at the end of the test should not normally exceed 40 mg/L medium.

The Inorganic Carbon content of the test material in the culture media must be less than 5% of the Total Carbon on day 0.

Conclusion C24-30 Alkenes, Branched and Linear cannot be considered to be readily biodegradable under the strict terms and conditions of OECD Guideline No. 301B

Reliability (1) valid without restriction

Flag confidential

14.02.2001 SafePharm Laboratories LImited, (2000). Assessment of Ready Biodegradability; CO2 Evolution Test. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-05-l

Oral

Type	LD50
Species	rat
Strain	other: Sprague-Dawley Crl:CD®BR
Sex	male/female
Number of animals	10
Vehicle	Peanut Oil
Value	>= 5000 - mg/kg bw

Method	OECD Guide-line 40 1 "Acute Oral Toxicity"
Year	1998
GLP	yes
Test substance	other TS: C24-30 Alkenes, Branched and Linear (even-numbered carbons only)
Result	No signs of systemic toxicity were noted during the study. All surviving animals showed expected weight gain during the study. Surviving animals showed no abnormalities at necropsy. The acute oral median lethal dose (LD50) of the test material in the Sprague-Dawley strain rat was found to be greater than 5000 mg/kg bodyweight.
Test condition	A study was performed to assess the acute oral toxicity of the test material in the Sprague-Dawley strain rat. Following a range-finding study, a group of ten fasted animals (five males and five females) was given a single oral dose of undiluted test material at a dose level of 5000 mg/kg bodyweight. The animals were observed for fourteen days after the day of dosing and were then killed and subjected to gross necropsy.
Conclusion	The acute oral median lethal dose (LD50) of the test material in the Sprague-Dawley strain rat was found to be greater than 5000 mg/kg bodyweight.
Reliability	(1) valid without restriction
Flag	confidential
13.02.2001	SafePharm Laboratories LImited, (1998). Acute Oral Toxicity Study in The Rat. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 182636-05-l
Genetic Toxicity

Type	other: Salmonella typhimuxium and Escherichia coli/Mammalian-Microsome Reverse Mutation Assay
System of testing	Bacterial
Concentration	0, 15, 50, 150, 500, 1500, 5000
Cycotoxic conc.	>5000 ug/plate
Metabolic activation	with and without
Result	negative
Method	OECD Guide-line 47 1 "Genetic Toxicology: Salmonella thyphimuriurn Reverse Mutation Assay"
Year	1998
GLP	yes
Test substance	other TS: C24-30 Alkenes, Branched and Linear (even-numbered carbons only)
Result	The test material caused no visible reduction in the growth of the bacterial lawn at any dose level either with or without metabolic activation. The test material

was therefore tested up to a maximum recommended dose level of 5000 ug/plate. An opaque film was observed at and above 1500 ug/plate with oily droplets observed at 5000 ug/plate under a dissection microscope; this however did not interfere with the scoring of revertant colonies. No significant increase in the frequency of revertant colonies was recorded for any of the bacterial strains with any dose of the test material, either with or without metabolic activation.

The vehicle, dimethyl sulphoxide (DMSO) and untreated control plates produced counts of revertant colonies within the normal range.

All of the positive control chemicals used in the test induced marked increases in the frequency of revertant colonies and the activity of the S9 fraction was shown to be satisfactory.

The test material was found to be nonmutagenic under the conditions of this test.

Test condition

Salmonella typhimurium strains TA1535, TA1537, TA98, and TA100 and Escherichia coli strain WP2uvrA- were treated with the test material using the Ames plate incorporation method at six dose levels, in triplicate, both with and without the addition of a rat liver homogenate metabolizing system (10% liver S9 in standard co-factors). The dose range was determined in a preliminary toxicity assay and was 15 to 5000 ug/plate in the first experiment. A second experiment was performed using the same dose range as Experiment 1, fresh cultures of the bacterial strains, and fresh chemical formulations. Vehicle, dimethyl sulphoxide (DMSO), untreated (negative) and positive controls were included in each experiment.

For the test, 0.1 mL of bacterial culture, 2.0 mL of top agar, 0.1 mL of the test material formulation, vehicle or positive control and either 0.5 mL of S9 mix or phosphate buffer was mixed together and poured onto the surface of a Vogel-Bonner Minimal agar plate. The plates were incubated for 48 hours at 370C after an initial overnight equilibration period and the frequency of revertant colonies was assessed.

For a substance to be considered positive in this test system, it should have induced a dose-related and statistically significant increase in the revertant count in one or more strains of bacteria in the presence and/or absence of S9 in both experiments. To be considered negative, the number of revertants at each dose level should have been less than twofold the vehicle control frequency for TA100, TA98 and WP2uvrA- and threefold for TA1535 and TA1537. Statistical significance was analyzed using the methods recommended by the UKEMS [Reference: Kirkland, D.J., Ed., Statistical Evaluation of Mutagenicity Test Data, UKEMS sub-committee on Guidelines for Mutagenicity Testing. Report Part III (1989) Cambridge University Press.].

Conclusion

C24-30 Alkenes, Branched and Linear, was not mutagenic in this test.

Reliability

(1) valid without restriction

Flag

confidential

13.02.2001 SafePharm Laboratories Limited (1998). Salmonella typhimurium and Escherichia coli/Mammalian-Microsome Reverse Mutation Assay. Conducted for Chevron Research and Technology Company, unpublished report.

CAS No. 558-37-2
Oral

Test Substance	Neohexene (3,3-dimethylbutene-1) CAS# 558-37-2 98.5% purity.
Method/guideline Followed	OECD 40 1.
Type (test type)	Acute oral toxicity study
GLP	Not specified .
Year	1982
Species/Strain	Rat/Sprague-Dawley
Sex	Male and female
No. of animals per sex per dose	S/sex/group
Vehicle	None
Route of admin	Oral gavage
Test Conditions	One group of five rats/sex was dosed orally at a level of 5000 mg/kg of body weight. The animals were observed at 1, 2, and 4 hours after dosing, and daily for a period of 14 days for mortality and signs of systemic toxicity. Body weights were recorded prior to treatment and at 7 and 14 days. The animals were necropsied at the end of the 14-day period and observed for gross abnormalities.
Results LD_{50}.	LD_{50} = >5 g/kg
Remarks	No animals died after dosing at 5000 mg/kg. Clinical signs of toxicity noted 1 hour after dosing included depression, soft feces, a hunched appearance, and rough fur coat. All animals appeared normal from Day 2 through termination of the study. All animals gamed weight during the study. There were no significant findings at necropsy.
Conclusions (contractor)	The acute oral LD_{50} for the test substance was >5 g/kg.
Data Quality Reliability	1 - Reliable without restrictions.
References	Hazleton Laboratories America, Inc. (1982). Acute Oral Toxicity Study in Rats. Conducted for Phillips Petroleum Company, unpublished report.
Other Last changed	5/8/01

CAS No. 558-37-2
Inhalation

Test Substance	Neohexene (3,3-dimethylbutene-1) CAS# 558-37-2 98.5% purity.
Method/guideline Followed	OECD 403.
Type (test type)	Acute inhalation toxicity study
GLP	Not specified
Year	1982
Species/Strain	Rat/Sprague-Dawley
Sex	Male and female
No. of animals per sex per dose	S/sex/group
Vehicle	None
Route of admin	Inhalation
Test Conditions	One group of five rats/sex was placed in a 38 liter exposure chamber and exposed for four hours to the maximum practical vapor concentration. Analytical chamber concentrations were measured using a total hydrocarbon monitor (method or frequency not specified). The animals were observed hourly during the exposure and twice daily for a period of 14 days for mortality and signs of systemic toxicity. Body weights were recorded prior to treatment and at 2, 3, 4, 7, and 14 days. The animals were necropsied at the end of the 14-day period and observed for gross abnormalities.
Results	
LC_{50}	LC_{50} = >5 1,000 ppm.
Remarks	The mean analytical exposure concentration was 5 1,000 ppm. No animals died during the study. All the rats were observed prostrate in their cages during the exposure. All animals appeared normal throughout the post-exposure observation period. All animals gained weight during the study except the females at the Day 3 interval (slight group mean weight loss). There were no significant findings at necropsy.
Conclusions (contractor)	The acute inhalation LC_{50} for vapors of the test substance was >5 1,000 ppm.
Data Quality Reliability	1 - Reliable without restrictions.
References	Hazleton Laboratories America, Inc. (1982). Acute Inhalation Toxicity Test in Rats. Conducted for Phillips Petroleum Company, unpublished report.
Other	
Last changed	05-08-200 1

CAS No. 558-37-2
Genetic Toxicity - in Vitro

Test Substance	Neohexene (3,3-dimethylbutene-1) CAS# 558-37-2 ***98.5%*** purity.
Method/guideline Followed	OECD 47 1
Type	*Salmonella typhimurium* mammalian microsome plate incorporation **assay** (Ames Assay).
System of testing	Bacterial
GLP	Not specified
Year	1982
Species/Strain	*Salmonella* / TA98, TA100, TA1535, TA1537, and TA1538
Metabolic activation	With and without
Species and cell type	Rat liver S9 fraction
Quantity	0.5 ml/plate
Induced or not induced	Arochlor 1254-induced (500 mg/kg for 5 days)
Concentrations Tested	0, 32.3, 96.5, 289.5, 868.4, and 2605 ug/plate
Control groups and treatment	Solvent control: dimethylsulfoxide (DMSO). Positive controls: N-Methyl-N'-nitro-N-nitrosoguanidine (MNNG), 9-aminoacridine (9-AA), 2-nitrofluorene (2-NF), 2-aminoanthracene (2-AA).
Statistical Methods	A positive response was defined as a reproducible, dose-related increase in revertant colonies over three concentrations with the baseline increase twice the solvent control level.
Remarks for Test Conditions	Five different *Salmonella* strains were tested in the presence and absence of rat liver S-9. The test substance was soluble in the solvent (dimethylsulfoxide, DMSO) at 100 mg/ml. Five dose levels were tested, with three plates per dose level. The maximum dose selected was 2605 ug/plate based on observed growth inhibition during an initial toxicity test. Concurrent positive controls were also tested with and without metabolic activation.
Results	
Genotoxic effects	Negative. The test substance was not mutagenic in any of the five strains of ***Salmonella*** tested in the presence or absence of Aroclor-induced rat liver S9.

Conclusions (study author)	The test substance was not mutagenic in the Ames Salmonella mutagenicity test.
Data Quality Reliabilities	1 ▪ Reliable without restrictions.
Reference	Hazleton Laboratories America, *Inc.* (1982). *Salmonella typhimurium* mammalian microsome plate incorporation assay. Conducted for Phillips Petroleum Company, unpublished report.
Other Last changed	08-May-01

Genetic Toxicity ▪ in Vitro
CAS No. 558-37-2

Test Substance	Neohexene (3,3-dimethylbutene-1) CAS# 558-37-2 98.5% purity.
Method/guideline Followed	OECD 479
Type	*In vitro* sister chrornatid exchange (SCE) assay in Chinese hamster ovary cells
System of testing	Chinese hamster ovary (CHO) cells
GLP	Not specified
Year	1982
Metabolic activation	Aroclor 1254-induced Sprague-Dawley rat liver S9
Concentrations tested	0, 1.3, 4.4, 13.2, 44, and 132 ug/ml
Control groups and treatment	Solvent controls: dimethylsulfoxide (DMSO). Positive controls: ethylmethanesulfonate (without S9), cylcophosphamide (with S9).
Statistical Methods	Not specified
Remarks for Test Conditions	The test substance was tested in cultured Chinese hamster ovary (CHO) cells for induction of sister chromatid exchanges (SCE) both in the presence and absence of Aroclor 1254-induced Sprague-Dawley rat liver S9. The test included concurrent solvent and positive controls and five doses of the test substance. The test substance was soluble in the solvent (DMSO) at 100 mg/ml. The maximum dose selected was 132 ug/plate based on observed growth inhibition in an initial toxicity study. Duplicate cultures were prepared for all dose levels and controls. Cells were exposed to the test substance for 2 hours, washed twice, and BrdU added to each culture. Cells were sampled 24 hours after BrdU addition; colcemid was added 2 hours prior to fixation. Fifty second-division metaphase cells were scored for frequency of SCEs/cell from each dose level.

Results	
Genotoxic effects	Negative. No increases in SCEs were noted in cultured CHO cells treated with the test substance, with or without S9.
Conclusions (study author)	Under the conditions of this study, the test substance did not exhibit a positive response and is therefore considered not to be mutagenic in this test system.
Data Quality	
Reliabilities	1 - Reliable without restrictions.
Reference	Hazleton Laboratories America, Inc. (1982). *In* vitro sister chromatid exchange assay in Chinese hamster ovary cells. Conducted for Phillips Petroleum Company, unpublished report.
Other	
Last changed	08-May-01

Acute Toxicity
Oral

Test Substance	C 18-C24 alpha olefin
Method/guideline Followed	16 CFR 1500.3 (c)(2)(i)
Type (test type)	Acute effects evaluation
GLP	No
Year	1977
Species/Strain	Rat /CFE
Sex	males & females
No. of animals per sex/dose	5 rats/sex/dose
Vehicle	None specified
Route of admin	Oral gavage
Test Conditions	Ten healthy CFE rats (5M:5F) with body weights averaging approximately 250 grams were used to determine the oral toxicity of the test sample. Animals were fasted approximately 18 hours prior to dosing but had ready access to water. Each rat received a single oral dose of 10 grams/kg body weight of test compound by gastric intubation. Animals were observed for mortality and body weight changes for 14 days post-dosing. After 14 days. All surviving animals were sacrificed and necropsies were performed.

Results	
LD_{50} with confidence limits.	All rats dosed with 10 grams/kg body weight survived the 14-day observation period, The oral LD50 for the test material was determined to be greater than 10 grams/kg body weight. Body weight gain was within normal limits.
Remarks	Gross autopsy findings revealed blanched and mottled kidneys in most rats.
Conclusions (study author)	Under the conditions of the test, the study material is not considered to be a toxic substance when administered by the oral route.
Data Quality	
Reliability	1. Reliable without restrictions
References	Toxicology Evaluation of Ethyl Compound 100-527, (1977) Gulf South Research Institute P.O. Box 1177 New Iberia, LA
Other	
Last changed	

Acute Toxicity
Dermal

Test Substance	C 18-C24 alpha olefin
Method/guideline Followed	16 CFR 1500.40 & CFR 1500.3 (c)(l)(ii) (c) (2) (iii)
Type (test type)	Acute effects evaluation
GLP	No
Year	1977
Species/Strain	Rabbit/New Zealand Albino
Sex	males & females
No. of animals per sex/dose	3 rabbits/sex/dose
Vehicle	None specified
Route of admin	Dermal
Test Conditions	Six healthy New Zealand albino rabbits (3M:3F) were used to evaluate the toxicity of the test material following dermal application of 10 grams/kg body weight. Prior to application of test material, the animals were prepared by shaving the application site and abrading the skin every two to three centimeters longitudinally over one-half the exposure area. Test material was held in contact with the skin by means of saran wrap covered with brown paper for 24 hours. Animals were observed for mortality and general behavior for 14 days post

dosing. On the 14th day all surviving animals were sacrificed and necropsies were performed.

Results

LD_{50} with confidence limits. All rabbits dosed with 10 grams/kg body weight survived the 14-day observation period. The dermal LD50 for the test material was determined to be greater than 10 grams/kg body weight.

Remarks Five out of the six animals had satisfactory weight gain during the study. One female rabbit had a slight decrease in body weight.

Conclusions (study author) Under the conditions of the test, the study material is not considered to be a toxic substance when administered by the dermal route.

Data Quality

Reliability 1. Reliable without restrictions

References Toxicology Evaluation of Ethyl Compound 100-527, (1977) Gulf South Research Institute P.O. Box 1177 New Iberia, LA

Other

Last changed

Acute Toxicity

Oral

Test Substance C 18-C26 alpha olefin

Method/guideline Followed 16 CFR 1500.3 (c)(2)(i)

Type (test type) Acute effects evaluation

GLP No

Year 1977

Species/Strain Rat /CFE

Sex males & females

No. of animals per sex/dose 5 rats/sex/dose

Vehicle None specified

Route of admin Oral gavage

Test Conditions Ten healthy CFE rats (5M:5F) with body weights averaging approximately 250 grams were used to determine the oral toxicity of the test sample. Animals were fasted approximately 18 hours prior to dosing but had ready access to water. Each rat received a single oral dose of 10 grams/kg body weight of test compound by gastric intubation. Animals were observed for mortality and body

	weight changes for 14 days post-dosing. After 14 days. All surviving animals were sacrificed and necropsies were performed.
Results	
LD_{50} with confidence limits.	All rats dosed with 10 grams/kg body weight survived the 14-day observation period. The oral LD50 for the test material was determined to be greater than 10 grams/kg body weight. Body weight gain was within normal limits.
Remarks	Gross autopsy findings revealed blanched and mottled kidneys in most rats.
Conclusions (study author)	Under the conditions of the test, the study material is not considered to be a toxic substance when administered by the oral route.
Data Quality	
Reliability	2. Reliable with restrictions
References	Toxicology Evaluation of Ethyl Compound 100-494, (1977) Gulf South Research Institute P.O. Box 1177 New Iberia, LA
Other	
Last changed	

Acute Toxicity
Dermal

Test Substance	C 18-C26 alpha olefin
Method/guideline Followed	16 CFR 1500.40 & CFR 1500.3 (c)(1)(ii) (c) (2) (iii)
Type (test type)	Acute effects evaluation
GLP	No
Year	1977
Species/Strain	Rabbit/New Zealand Albino
Sex	males & females
No. of animals per sex/dose	3 rabbits/sex/dose
Vehicle	None specified
Route of admin	Dermal
Test Conditions	Six healthy New Zealand albino rabbits (3M:3F) were used to evaluate the toxicity of the test material following dermal application of 10 grams/kg body weight. Prior to application of test material, the animals were prepared by shaving the application site and abrading the skin every two to three centimeters longitudinally over one-half the exposure area. Test material was held in contact

with the skin by means of saran wrap covered with brown paper for 24 hours. Animals were observed for mortality and general behavior for 14 days post dosing. On the 14th day all surviving animals were sacrificed and necropsies were performed.

Results

LD_{50} with confidence limits. All rabbits dosed with 10 grams/kg body weight survived the 14 day observation period. The dermal LD50 for the test material was determined to be greater than 10 grams/kg body weight.

Remarks All six animals had satisfactory weight gain during the study.

Conclusions (study author) Under the conditions of the test, the study material is not considered to be a toxic substance when administered by the dermal route.

Data Quality

Reliability 1. Reliable without restrictions

References Toxicology Evaluation of Ethyl Compound 100-494, (1977) Gulf South Research Institute P.O. Box 1177 New Iberia, LA

Other

Last changed

Repeat Dose Toxicity

Oral

Test Substance C 16- 18 isomerised olefin

Remarks C14-0.4%, C16-53.6%, C18-37.6%, C20-7.9%, C22-0.5%. Linear terminal 1.8%, linear internal 7 1.9%, Branched terminal 15.6% Trisubstituted 10.7%.

Method/guideline Followed OECD 407

Test type Subacute toxicity

GLP Yes

Year 2000

Species rat

Strain Sprague Dawley (crl: CD BR)

Route of admin Oral gavage

Duration of test 4 weeks

Doses/concentration Levels 0, 25, 150, and 1000 mg/kg/day

Sex	5M, SF/group
Exposure period	4 weeks
Frequency of Treatment	once/day, 7 days/week
Control group and treatment	5M, 5F; corn oil vehicle
Post exposure observation period	None
Statistical methods	Analysis of variance (Snedecor and Cochran, 1980) Kruskal-Wallis non-parametric analysis (Hollander and Wolfe, 1973) Fisher's Exact Probability test (Siegel 1956)
Test Conditions	Groups of ten rats (5M:5F) were dosed orally by gavage once daily over a period of 28 days. Animals were approximately 41 days old on the first day of dosing. Animals were regularly monitored for any signs of ill health or reaction to treatment. Detailed functional observations were performed weekly, with additional functional observations performed during pretrial and week four. Body weights and food consumption were recorded twice weekly. Blood and urine samples were collected during week four of the study. After four weeks of treatment animals were sacrificed and subjected to necropsy. A comprehensive list of organs were weighed and /or preserved. Tissues from the controls and high dose animals were subjected to histological examination. Histology was also performed on the male kidneys from the lower doses.
Results	
NOAEL (NOEL)	NOAEL = 1000 mg/kg/day
LOAEL (LOEL)	NOEL = 150 mg/kg/day LOEL = 1000 mg/kg/day
Remarks	There was little evidence of toxicity noted in animals treated at levels up to 1000 mg/kg/day. A slight increase in male body weight was noted at 1000 mg/kg but did not achieve statistical significance. Equivocal changes in urinary volume (higher than controls) and kidney weight (lower than controls) were considered unlikely to be treatment related in the absence of any macro- or microscopic changes. There were no treatment related findings associated with treatment at 25 or 150 mg/kg/day.
Conclusions (study authors)	Under conditions of the study it was concluded that for both sexes the no obvious adverse effect level was 1000 mg/kg body weight per day.
Quality Reliabilities	1. Reliable without restrictions.
References	Clubb, S. 2000. AmoDrill 1000 4-Week Toxicity Study Including Neurotoxicity Screening in Rats with Administration by Gavage. Inveresk Project Number

454729. Inveresk Report Number 1756 1. Inveresk Research Tranent EH33 2NE Scotland. Sponsor Amoco Corporation.

Other
Last Changed

Acute Toxicity
Oral

Test Substance	C14-18 alpha olefin
Method/guideline Followed	16 CFR 1500.3 (c)(2)(i)
Type (test type)	Acute effects evaluation
GLP	No
Year	1977
Species/Strain	Rat /CFE
Sex	males & females
No. of animals per sex/dose	5 rats/sex/dose
Vehicle	None specified
Route of admin	Oral gavage
Test Conditions	Ten healthy CFE rats (5M:5F) with body weights averaging approximately 250 grams were used to determine the oral toxicity of the test sample. Animals were fasted approximately 18 hours prior to dosing but had ready access to water. Each rat received a single oral dose of 10 grams/kg body weight of test compound by gastric intubation. Animals were observed for mortality and body weight changes for 14 days post-dosing. After 14 days. All surviving animals were sacrificed and necropsies were performed.
Results	
LD_{50} with confidence limits.	All rats dosed with 10 grams/kg body weight survived the 14-day observation period. No signs of intoxication were seen during the observation period. The oral LD50 for the test material was determined to be greater than 10 grams/kg body weight. Body weight gain was within normal limits.
Remarks	Gross autopsy findings revealed blanched and mottled kidneys in most rats,
Conclusions (study author)	Under the conditions of the test, the study material is not considered to be a toxic substance when administered by the oral route.
Data Quality	
Reliability	1. Reliable without restrictions

References Toxicology Evaluation of Ethyl Compound 100-606, (1977) Gulf South Research Institute P.O. Box 1177 New Iberia, LA 70560

Other
Last changed

CAS No. 68526-52-3
Acute Fish Toxicity

Test Substance	CAS No. 68526-52-3; Alkenes, C6 Rich
Method/Guideline	OECD 203
Year (guideline)	1992
Type (test type)	Semistatic Fish Acute Toxicity Test
GLP	Yes
Year (performed)	1995
Species	Rainbow Trout (Oncorhynchus mykiss)
Analytical Monitoring	Yes
Exposure Period	96-hour
Statistical Method	Trimmed Spearman-Karber Method (Hamilton, M.A. et al. 1977. Trimmed Spearman-Karber Method for Estimating Median Lethal Concentration in Toxicity Bioassays. Environ. Sci. Technol. 11:7 14-7 19.)

Test Conditions

Note: Test material loading preparation, vessel type, volume, replication, water quality parameters, environmental conditions, and test organism supplier, age, size, weight, and loading.

Each test solution was prepared by adding the test substance, via syringe, to 19.5 L of laboratory blend water in 20 L glass carboys. The solutions were mixed for 24 hours with a vortex of ≤10%. Mixing was performed using a magnetic stir plate and Teflon@ coated stir bar at room temperature (approximately 22C). After mixing, the solutions were allowed to settle for one hour after which the Water Accommodated Fraction (WAF) was siphoned from the bottom of the mixing vessel through a siphon that was placed in the carboy prior to adding the test material. Test vessels were 4.0 L aspirator bottles that contained approximately 4.5 L of test solution. Each vessel was sealed with no headspace after 5 fish were added. Three replicates of each test material loading were prepared. Approximately 80% of each solution was renewed daily from a freshly prepared WAF.

Test material loading levels included: 6.25, 12.5, 25, 50, and 100 mg/L, which measured 2.9, 6.6, 13.4, 16.9, and 44.0 mg/L, respectively, and are based on the mean of samples taken from the new and old test solutions. A control containing no test material was included and the analytical results were below the quantitation limit, which was 0.2 mg/L.

Test temperature was 16C (sd = 0.04). Lighting was 623 to 629 Lux with a 16-hr light and 8-hr dark cycle. Dissolved oxygen ranged from 7.7 to 9.6 mg/L for "new" solutions and 4.5 to 7.5 mg/L for "old" solutions. The pH ranged from 8.2 to 8.5 for "new" solutions and 7.2 to 7.7 for "old" solutions.

Fish supplied by Thomas Fish Co. Anderson, CA, USA; age at test initiation = approximately 5 weeks; mean wt. at test termination = 0.375 g; mean total length at test termination = 3.6 cm; test loading = 0.42 g of fish/L. The fish were slightly

shorter than the guideline suggestion of 4.0 to 6.0 cm, which were purposely selected to help maintain oxygen levels in the closed system. Fish size had no significant effect on study outcome.

Results

Units/Value

Note: Deviations from protocol or guideline, analytical method, biological observations, control survival.

96-hour LL50 = 12.8 mg/L (95% CI 10.7 to 15.3 mg/L) based upon loading rates. 96-hour LC50 = 6.6 mg/L (95% CI 5.4 to 8.0 mg/L) based upon measured values of old and new solutions.

Analytical method used was Headspace Gas Chromatography with Flame Ionization Detection (GC-FID).

Loading Rate (mg/L)	Measured Conc. (mg/L)	Fish Total Mortality (@96 hrs)*
Control	Control	0
6.25	2.9	0
12.5	6.6	7
25	13.4	15
50	16.9	15
100	44.0	15

* 15 fish added at test initiation

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1996. Fish, Acute Toxicity Test. Study #119058. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA,

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-52-3
Biodegradation

Test Substance	CAS No. 68526-52-3; Alkenes, C6 Rich
Method/Guideline	OECD 30 1F
Year (guideline)	1993
Type (test type)	Ready Biodegradability, Manometric Respirometry Test
GLP	Yes
Year (performed)	1995
Inoculum	Domestic activated sludge
Exposure Period	28 days

Test Conditions

Note: Test material loading preparation, vessel type, replication, test conditions.

Activated sludge and test medium were combined prior to test material addition. Test medium consisted of glass distilled water and mineral salts (phosphate buffer, ferric chloride, magnesium sulfate, and calcium chloride).

Test vessels were 1 L glass flasks placed in a waterbath and electronically monitored for oxygen consumption.

Test material was tested in triplicate, controls and blanks were tested in duplicate. Test material loading was approximately 40 mg/L. Sodium benzoate (positive control) concentration was approximately 44 mg/L. Test temperature was 22 +/- 1 Deg C.

All test vessels were stirred constantly for 28 days using magnetic stir bars and plates.

Results

Units/Value

Note: Deviations from protocol or guideline, analytical method.
Approximately 2 1% biodegradation of the test material was measured on day 28. Approximately 10% biodegradation was achieved on day 19.

By day 14, >60% biodegradation of the positive control was measured, which meets the guideline requirement. No excursions from the protocol were noted.

Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test material as calculated using results of an elemental analysis of the test material.

Sample	% Degradation* (day 28)	Mean % Degradation (day 28)
Test Material	25.9, 10.5, 27.4	21.3
Na Benzoate	98.9,95.5	97.2

* replicate data

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1997. Ready Biodegradability: OECD 301F Manometric Respirometry. Study #119094A. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-54-5
Acute Fish Toxicity

Test Substance CAS No. 68526-54-5; Alkenes, C7-9, C8 Rich
Method/Guideline OECD 203
Year (guideline) 1992
Type (test type) Semistatic Fish Acute Toxicity Test
GLP Yes

Year (performed) 1995

Species Rainbow Trout (Oncorhynchus mykiss)

Analytical Monitoring **Yes**

Exposure Period: 96-hour

Statistical Method

Trimmed Spearman-Karber Method (Hamilton, M.A. et al. 1977. Trimmed Spear-man-Karber Method for Estimating Median Lethal Concentration in Toxicity Bioassays. Environ. Sci. Technol. 11:714-719.)

Test Conditions

Note: Test material loading preparation, vessel type, volume, replication, water quality parameters, environmental conditions, and test organism supplier, age, size, weight, and loading.

Each test solution was prepared by adding the test substance, via syringe, to 19.5 L of laboratory blend water in 20 L glass carboys. The solutions were mixed for 24 hours with a vortex of ≤10%. Mixing was performed using a magnetic stir plate and Teflon@ coated stir bar at room temperature (approximately 22C). After mixing, the solutions were allowed to settle for one hour after which the Water Accommodated Fraction (WAF) was siphoned from the bottom of the mixing vessel through a siphon that was placed in the car-boy prior to adding the test material. Test vessels were 4.0 L aspirator bottles that contained approximately 4.5 L of test solution. Each vessel was sealed with no headspace after 4 fish were added. Three replicates of each test material loading were prepared. Approximately 80% of each solution was renewed daily from a freshly prepared WAF.

Test material loading levels included: 2.6, 4.3, 7.2, 12, and 20 mg/L, which measured 0.2, 0.4, 0.7, 1.2, and 2.5 mg/L, respectively, and are based on the mean of samples taken from the new and old test solutions. A control containing no test material was included and the analytical results were below the quantitation limit, which was 0.2 mg/L.

Test temperature was 15C (sd = 0.09). Lighting was 578 to 580 Lux with a 16-hr light and 8-hr dark cycle. Dissolved oxygen ranged from 8.5 to 10.2 mg/L for "new" solutions and 6.5 to 8.5 mg/L for "old" solutions. The pH ranged from 7.0 to 8.8 for "new" solutions and 7.0 to 8.4 for "old" solutions.

Fish supplied by Thomas Fish Co. Anderson, CA, USA; age at test initiation = approximately 5 weeks; mean wt. at test termination = 0.272 g; mean total length at test termination = 3.5 cm; test loading = 0.24 g of fish/L. The fish were slightly shorter than the guideline suggestion of 4.0 to 6.0 cm, which were purposely selected to help maintain oxygen levels in the closed system. Fish size had no significant effect on study outcome.

Results Units/Value

Note: Deviations from protocol or guideline, analytical method, biological observations, control survival.

96-hour LL50 = 8.9 mg/L (95% CI 9.9 to 13.3 mg/L) based upon loading rates.

96-hour LC50 = 0.87 mg/L (95% CI 0.79 to 0.96 mg/L) based upon measured values of old and new solutions.

Analytical method used was Headspace Gas Chromatography with Flame Ionization Detection (GC-FID).

Loading Rate (mg/L)	Measured Conc. (mg/L)	Fish Total Mortality (@96 hrs)*
Control	Control	0
2.6	0.2	0
4.3	0.4	0
7.2	0.7	1
12	1.2	12
20	2.5	12

* 12 fish added at test initiation

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1996. Fish, Acute Toxicity Test. Study #119158. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-54-S
Biodegradation

Test Substance CAS No. 68526-54-5; Alkenes, C7-9, C8 Rich
Method/Guideline OECD 301F
Year (guideline) 1993
Type (test type) Ready Biodegradability, Manometric Respirometry Test
GLP Yes
Year (performed) 1995
Inoculum Domestic activated sludge
Exposure Period 28 days

Test Conditions **Note: Test material loading preparation, vessel type, replication, test conditions.** Activated sludge and test medium were combined prior to test material addition. Test medium consisted of glass distilled water and mineral salts (phosphate buffer, ferric chloride, magnesium sulfate, and calcium chloride).

Test vessels were 1L glass flasks placed in a waterbath and electronically monitored for oxygen consumption.

Test material was tested in triplicate, controls and blanks were tested in duplicate. Test material loading was approximately 32 mg/L. Sodium benzoate (positive control) concentration was approximatley 44 mg/L.

Test temperature was 22 +/- 1 Deg C.
All test vessels were stirred constantly for 28 days using magnetic stir bars and plates.

Results

Units/Value

Note: Deviations from protocol or guideline, analytical method.
Approximately 29% biodegradation of the test material was measured on day 28. Approximately 10% biodegradation was achieved on day 17.
By day 14, >60% biodegradation of the positive control was measured, which meets the guideline requirement. No excursions from the protocol were noted. Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test material as calculated using results of an elemental analysis of the test material.

Sample	% Degradation* (day 28)	Mean % Degradation (day 28)
Test Material	44.1, 28.6, 15.0	29.2
Na Benzoate	98.9,95.5	97.2

* replicate data

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1997. Ready Biodegradability: OECD 301F Manometric Respirometry. Study #119 194A. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-56-7
Acute Fish Toxicity

Test Substance	CAS No. 68526-56-7; Alkenes, C9-11, Cl0 Rich
Method/Guideline	OECD 203
Year (guideline)	1992
Type (test type)	Semistatic Fish Acute Toxicity Test
GLP	**Yes**
Year (performed)	1995
Species	Rainbow Trout (Oncorhynchus mykiss)
Analytical Monitoring	**Yes**
Exposure Period	96-hour

Statistical Method

Trimmed Spear-man-Karber Method (Hamilton, M.A. et al. 1977. Trimmed Spearman-Karber Method for Estimating Median Lethal Concentration in Toxicity Bioassays. Environ. Sci. Technol. 11:714-719.)

Test Conditions

Note: Test material loading preparation, vessel type, volume, replication, water quality parameters, environmental conditions, and test organism supplier, age, size, weight, and loading.

Each test solution was prepared by adding the test substance, via syringe, to 19.5 L of laboratory blend water in 20 L glass carboys. The solutions were mixed for 24 hours with a vortex of ≤ 10%. Mixing was performed using a magnetic stir plate and Teflon@ coated stir bar at room temperature (approximately 22C). After mixing, the solutions were allowed to settle for one hour after which the Water Accommodated Fraction (WAF) was siphoned from the bottom of the mixing vessel through a siphon that was placed in the carboy prior to adding the test material. Test vessels were 4.0 L aspirator bottles that contained approximately 4.5 L of test solution. Each vessel was sealed with no headspace after 4 fish were added. Three replicates of each test material loading were prepared. Approximately 80% of each solution was renewed daily from a freshly prepared WAF.

Test material loading levels included: 0.2, 0.4, 1.2, 3.5, and 10 mg/L, which measured 0.0 1, 0.03, 0.06, 0.08, and 2.6 mg/L, respectively, and are based on the mean of samples taken from the new and old test solutions. A control containing no test material was included and the analytical results were below the quantitation limit, which was 0.03 mg/L.

Test temperature was 16C (sd = 0.2). Lighting was 445 to 555 Lux with a 16-hr light and 8-hr dark cycle. Dissolved oxygen ranged from 8.7 to 9.9 mg/L for "new" solutions and 7.2 to 8.5 mg/L for "old" solutions. The pH ranged from 7.0 to 8.8 for "new" solutions and 7.3 to 8.7 for "old" solutions.

Fish supplied by Thomas Fish Co. Anderson, CA, USA; age at test initiation = approximately 5 weeks; mean wt. at test termination = 0.175 g; mean total length at test termination = 3.0 cm; test loading = 0.19 g of fish/L. The fish were slightly shorter than the guideline suggestion of 4.0 to 6.0 cm, which were purposely selected to help maintain oxygen levels in the closed system. Fish size had no significant effect on study outcome.

Results

Units/Value

Note: Deviations from protocol or guideline, analytical method, biological observations, control survival.

96-hour LL50 = 4.8 mg/L (95% CI 3.8 to 6.0 mg/L) based upon loading rates.
96-hour LC50 = 0.12 mg/L (95% CI 0.11 to 0.14 mg/L) based upon measured values of old and new solutions.

Analytical method used was Headspace Gas Chromatography with Flame Ionization Detection (GC-FID).

Loading Rate (mg/L)	Measured Conc. (mg/L)	Fish Total Mortality (@96 hrs)*
Control	Control	0

0.2	0.01	0
0.4	0.03	0
1.2	0.06	0
3.5	0.08	3
10	0.26	15**

* 15 fish added at test initiation
** 1 mortality not test related

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1996. Fish, Acute Toxicity Test. Study #119258. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-56-7
Biodegradation

Test Substance CAS No. 68526-56-7; Alkenes, C9-11, Cl0 Rich
Method/Guideline OECD 301F
Year (guideline) 1993
Type (test type) Ready Biodegradability, Manometric Respirometry Test
GLP Yes
Year (performed) 1995
Inoculum Domestic activated sludge
Exposure Period 28 days

Test Conditions

Note: Test material loading preparation, vessel type, replication, test conditions.
Activated sludge and test medium were combined prior to test material addition. Test medium consisted of glass distilled water and mineral salts (phosphate buffer, ferric chloride, magnesium sulfate, and calcium chloride).

Test vessels were 1 L glass flasks placed in a waterbath and electronically monitored for oxygen consumption.

Test material was tested in triplicate, controls and blanks were tested in duplicate. Test material loading was approximately 42 mg/L. Sodium benzoate (positive control) concentration was approximately 44 mg/L.
Test temperature was 22 +/- 1 Deg C.
All test vessels were stirred constantly for 28 days using magnetic stir bars and plates.

Results
Units/Value

Note: Deviations from protocol or guideline, analytical method.
Approximately 21% biodegradation of the test material was measured on day 28. Approximately 10% biodegradation was achieved on day 17.

By day 14, >60% biodegradation of the positive control was measured, which meets the guideline requirement. No excursions from the protocol were noted. Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test material as calculated using results of an elemental analysis of the test material.

Samwle	% Degradation* (day 28)	Mean % Degradation (day 28)
Test Material	20.9, 19.9, 22.6	21.1
Na Benzoate	98.9,95.5	97.2

* replicate data

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1997. Ready Biodegradability: OECD 30 1F Manometric Respirometry. Study #119294A. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-58-9
Biodegradation

Test Substance	CAS No. 68526-58-9; Alkenes, C12-14, Cl3 Rich
Method/Guideline	OECD 301F
Year (guideline)	1993
Type (test type)	Ready Biodegradability, Manometric Respirometry Test
GLP	Yes
Year (performed)	1995
Inoculum	Domestic activated sludge
Exposure Period	28 days

Test Conditions

Note: Test material loading preparation, vessel type, replication, test conditions.
Activated sludge and test medium were combined prior to test material addition. Test medium consisted of glass distilled water and mineral salts (phosphate buffer, ferric chloride, magnesium sulfate, and calcium chloride).

Test vessels were 1L glass flasks placed in a waterbath and electronically monitored for oxygen consumption.

Test material was tested in triplicate, controls and blanks were tested in duplicate. Test material loading was 45 mg/L. Sodium benzoate (positive control) concentration was approximately 50 mg/L.
Test temperature was 22 +/- 1 Deg C.
All test vessels were stirred constantly for 28 days using magnetic stir bars and plates.

Results

Units/Value

Note: Deviations from protocol or guideline, analytical method.
Approximately 8% biodegradation of the test material was measured on day 28. By day 14, >60% biodegradation of the positive control was measured, which meets the guideline requirement. No excursions from the protocol were noted. Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test material as calculated using results of an elemental analysis of the test material.

Sample	% Degradation* 28)y	Mean % Degradation (day 28)
Test Material	6.28, 8.26, 8.35	7.63
Na Benzoate	88.2, 86.5	87.4

* replicate data

Conclusion

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1997. Ready Biodegradability: OECD 30 1F Manometric Respirometry. Study #119394A. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-58-9
Fish Acute Toxicity

Test Substance CAS No. 68526-58-9; Alkenes, Cl 1-13, Cl2 Rich
Method/Guideline OECD 203
Year (guideline) 1992
Type (test type) Semistatic Fish Acute Toxicity Test
GLP Yes
Year (performed) 1995
Species Rainbow Trout (Oncorhynchus mykiss)
Analytical Monitoring Yes

Exposure Period 96-hour

Statistical Method No mortality occurred; therefore, statistical analysis of the data was not warranted.

Test Conditions

Note: Test material loading preparation, vessel type, volume, replication, water quality parameters, environmental conditions, and test organism supplier, age, size, weight, and loading.
This test was conducted as a limit test, i.e., one test material exposure solution was tested. The test solution was prepared by adding the test substance, via

syringe, to 19.5 L of laboratory blend water in a 20 L glass carboy. The solution was mixed for 24 hours with a vortex of ≤ 10%. Mixing was performed using a magnetic stir plate and Teflon@ coated stir bar at room temperature (approximately 22C). After mixing, the solution was allowed to settle for one hour after which the Water Accommodated Fraction (WAF) was siphoned from the bottom of the mixing vessel through a siphon that was placed in the carboy prior to adding the test material. Test vessels were 4.0 L aspirator bottles that contained approximately 4.5 L of test solution. Each vessel was sealed with no headspace after 5 fish were added. Three replicates of the test material loading were prepared. Approximately 80% of each solution was renewed daily from a freshly prepared WAF.

The test material loading level was 86.0 mg/L. A control containing no test material was included. and the analytical results were below The lowest quantitation standard was 0.20 mg/L.

Test temperature was 16C. Lighting was 666 to 669 Lux with a 16-hr light and 8-hr dark cycle. Dissolved oxygen ranged from 9.0 to 9.8 mg/L for "new" solutions and 6.1 to 7.4 mg/L for "old" solutions. The pH ranged from 7.6 to 8.3 for "new" solutions and 7.3 to 7.9 for "old" solutions.

Fish supplied by Thomas Fish Co. Anderson, CA, USA; age at test initiation = approximately 5 weeks; mean wt. at test termination = 0.27 1 g; mean total length at test termination = 3.1 cm; test loading = 0.32 g of fish/L. The fish were slightly shorter than the guideline suggestion of 4.0 to 6.0 cm, which were purposely selected to help maintain oxygen levels in the closed system. Fish size had no significant effect on study outcome.

Results

Units/Value

Note: Deviations from protocol or guideline, analytical method, biological observations, control survival.
96-hour LLO = 86.0 mg/L based upon loading rates.

Analytical method used was Headspace Gas Chromatography with Flame Ionization Detection (GC-FID).

Loading Rate (mg/L)	Measured Conc. (mg/L)	Fish Total Mortality (@96 hrs)*
Control	ND	0
86.0	BD	0

* 15 fish added at test initiation
ND - not detected; the lowest analyzed standard was 0.20 mg/L
BD -below the lowest analyzed standard, 0.20 mg/L

Conclusion

The test material is not sufficiently water soluble to cause mortality to rainbow trout in a 96-hour acute toxicity test. Although the water solubility of this test material at a loading of 86.0 mg/L was not established, the sum of its components at this loading is likely to be less than 0.20 mg/L because this was the lowest standard used in the analyses that supported this study.

Reliability (1) Reliable without restriction

Reference Exxon Biomedical Sciences, Inc. 1996. Fish, Acute Toxicity Test. Study #1 19258. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.

Other (source) American Chemistry Council, Higher Olefins Panel

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CAS No. 68526-58-9
Biodegradation

Test Substance CAS No. 68526-58-9; Alkenes, C 11-13, C 12 Rich
Method/Guideline OECD 301F
Year (guideline) 1993
Type (test type) Ready Biodegradability, Manometric Respirometry Test
GLP Yes
Year (performed) 1995
Inoculum Domestic activated sludge
Exposure Period 28 days

Test Conditions

Note: Test material loading preparation, vessel type, replication, test conditions.
Activated sludge and test medium were combined prior to test material addition. Test medium consisted of glass distilled water and mineral salts (phosphate buffer, ferric chloride, magnesium sulfate, and calcium chloride).

Test vessels were IL glass flasks placed in a waterbath and electronically monitored for oxygen consumption.

Test material was tested in triplicate, controls and blanks were tested in duplicate. Test material loading was approximately 50 mg/L. Sodium benzoate (positive control) concentration was approximately 50 mg/L.
Test temperature was 22 +/- 1 Deg C.
All test vessels were stirred constantly for 28 days using magnetic stir bars and plates.

Results
Units/Value

Note: Deviations from protocol or guideline, analytical method.
Approximately 23% biodegradation of the test material was measured on day 28. By day 14, >60% biodegradation of the positive control was measured, which meets the guideline requirement. No excursions from the protocol were noted. Biodegradation was based on oxygen consumption and the theoretical oxygen demand of the test material as calculated using results of an elemental analysis of the test material.

Sample	% Degradation* (day 28)	Mean % Degradation (day 28)
Test Material	19.0, 23.8, 25.3	22.7
Na Benzoate	91.0, 81.3	86.3

* replicate data

Conclusion	
Reliability	(1) Reliable without restriction
Reference	Exxon Biomedical Sciences, Inc. 1997. Ready Biodegradability: OECD 301F Manometric Respirometry. Study #115894A. Exxon Biomedical Sciences, Inc., East Millstone, NJ, USA.
Other (source)	American Chemistry Council, Higher Olefins Panel

C12-16, Alpha Olefin Fraction
Repeat Dose Toxicity

Test Substance	C 12-l 6 Alpha Olefin Fraction (GULFTENE 12- 16)
Remarks	Blend of linear 1 -dodecene, 1 -tetradecene, and 1 -hexadecene
Method/guideline Followed	Other
Test type	Subacute toxicity
GLP	Yes
Year	1983
Species	rat
Strain	Fischer 344
Route of admin	Dermal
Duration of test	2 weeks
Doses/concentration Levels	0, 1 .O and 2.0 g/kg/day
Sex	Males and Females
Exposure period	2 weeks
Frequency of Treatment	once/day for 9 doses over 2-wk period
Control group and Treatment	5M, 5F; corn oil vehicle
Post exposure observation period	None
Statistical Methods	Organ weights: One-way analysis of variance and a Dunnett's test; Histopath: Kolmogorov-Smimov Two-Tail Test
Test Conditions	Dermal doses of 2.0 g/kg (undiluted) or 1 .O g/kg (diluted 1: 1 with corn oil) of GULFTENE 12-16 were administered to groups of 5 males and 5 female Fischer 344 rats, in 9 daily doses over a 2-wk period. Approximately 6 hrs following each application, residual test substance was wiped from the application site. Parameters evaluated for treatment-related effects included survival, body weight, food consumption, appearance and behavior, dermal reaction, hematology, chemical chemistry, organ weights, organ weight ratios relative to body and brain weights, gross pathology, and microscopic pathology (control and high-dose animals only).
Results	Repeated application of undiluted GULFTENE 12- 16 at 2.0 g/kg produced severe erythema (beet redness) to slight eschar formation (injuries in depth) and slight edema (edges of area well defined by definite raising) in all animals. Desquamation, hair loss and fissuring were also noted. Dermal reactions increased in severity with the number of applications.

When GULFTENE 12-16 was administered at a 1 .O g/kg level, 2 animals exhibited very slight erythema (barely perceptible) after 6 treatments and a third animal after seven treatments. In one of the 3, the intensity of the erythema increased to slight and a pinpoint spot of eschar was observed after the 7th treatment. All reactions persisted throughout the study period. No edema or other reactions were noted.

In comparison to controls, depressed body weight gains were observed in the 2.0 g/kg group but not in the 1 .O g/kg group. The decreases in body were associated with decreases in the absolute weights of most organ systems. The changes in body and organ weights resulted in statistically significant differences in the relative and organ/brain weight ratios for several organs. No treatment related effects were noted for food consumption, clinical signs (other than dermal reactions), hematology, and clinical chemistry. Treatment was associated with histological changes in the skin at the point of application. There were no other microscopic changes seen that could be associated with the test substance.

NOAEL (NOEL) NOAEL (systemic) = 1 g/kg/day [By summary author – study authors did not declare a NOAEL]

Remarks

Conclusions (study authors) Under conditions of the study it was concluded that repeated dermal applications of GULFTENE 12- 16 at 2.0 g/kg, but not at 1 .O g/kg, caused severe skin reactions and depressed body weight gains.

Quality Reliabilities 1. Reliable without restrictions,

References Gulf Life Sciences Center (1983) Two-Week Repeated Dose Toxicity Study in Rats Using GULFTENE 12-16. Conducted for Gulf Oil Chemicals Company, unpublished report.

Other

Last changed 5-17-01